

DECEMBER 1979

\$2.00

BASIC Chess Program • Calorie Counter • Apparat's NEWDOS

Personal Computing

For Your Home and Business



**Holiday Buyer's
Guide**

**Keeping
Tabs on
Service
Technicians**

Break-Even Analysis

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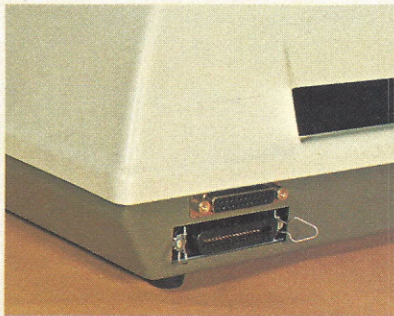
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current drive
mode re-

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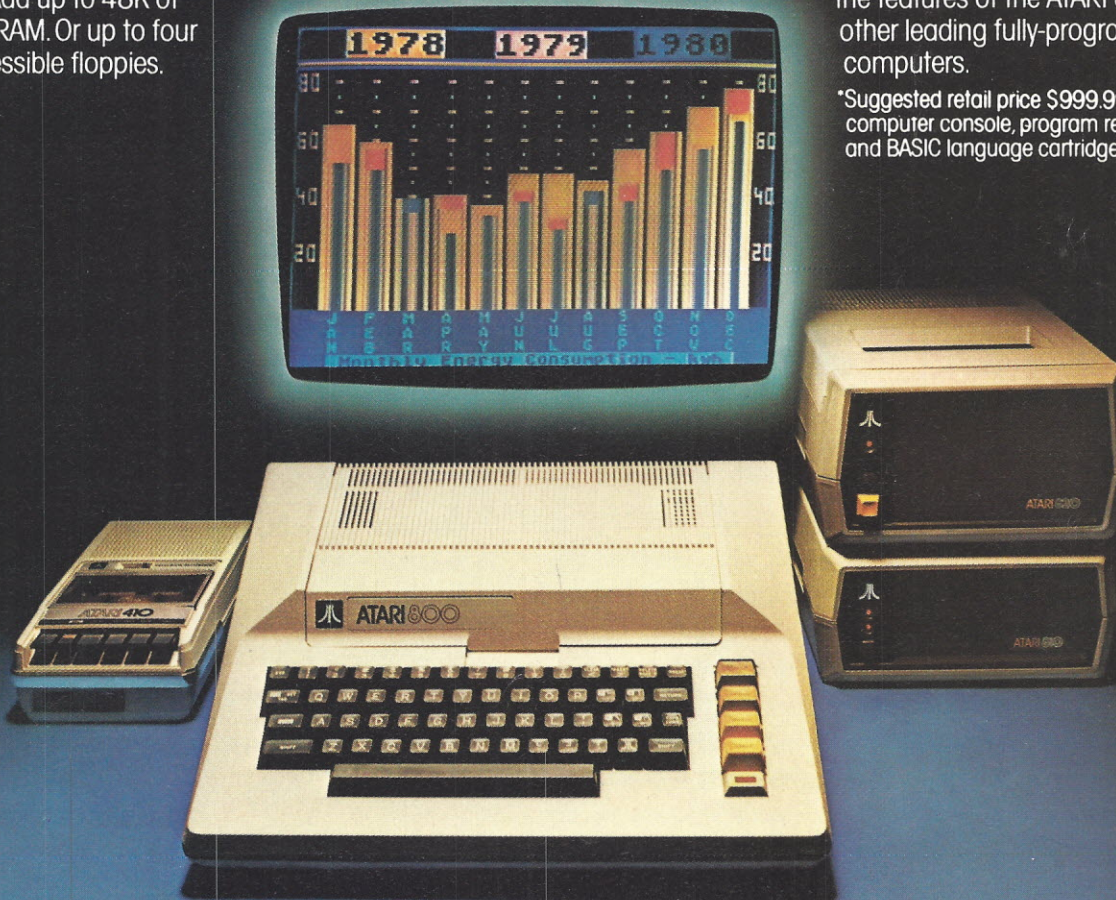
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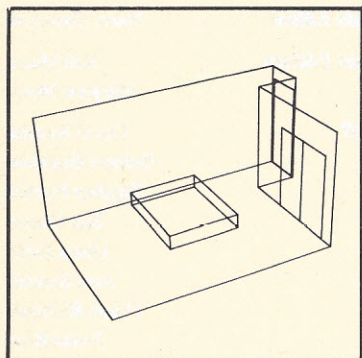
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Personal Computing

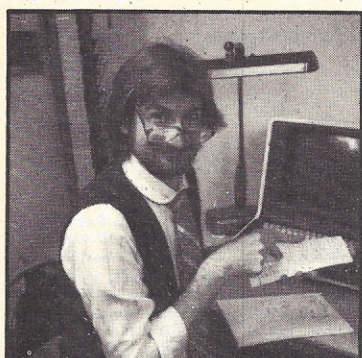
For Your Home and Business



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Index your magazines, books and other information sources with this short program. <i>by Margaret Whack</i>	

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Cover Design by Stephen C. Fischer

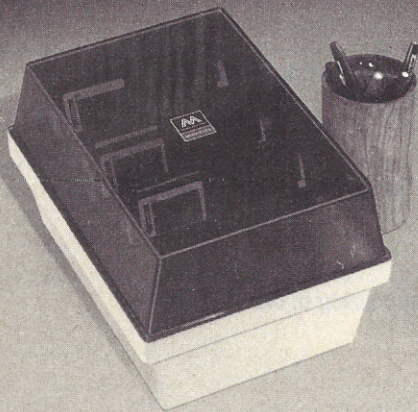
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CIRCLE 36

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RCA

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CIRCLE 32

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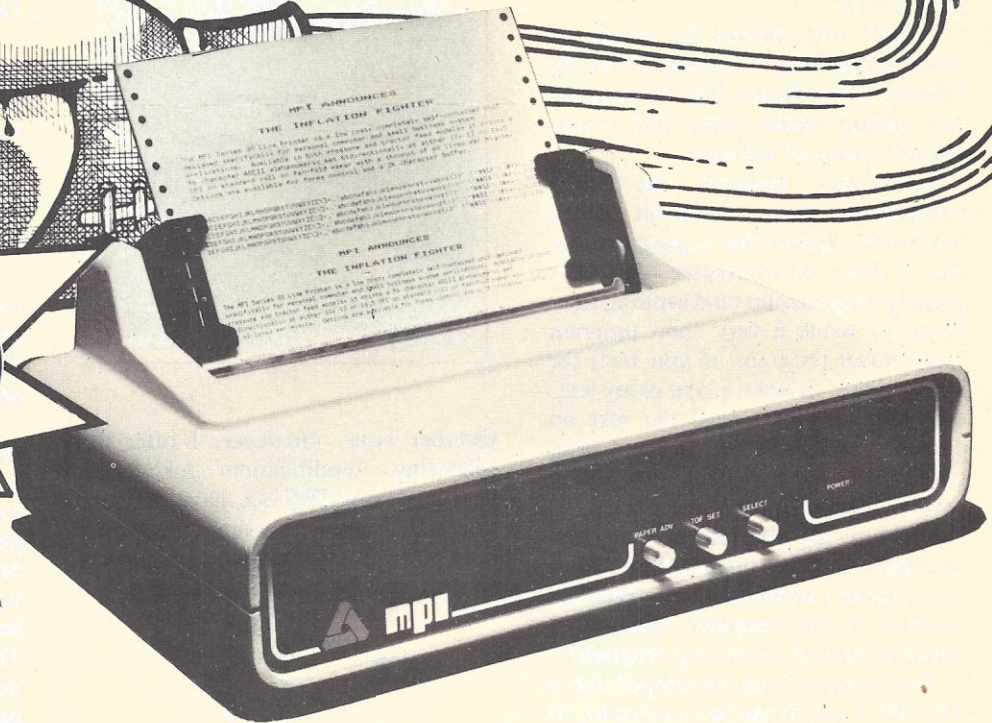
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CIRCLE 20

Two-Step Program

Dear Editor:

I read with interest the article on word processing (October 1979) by Charley Winterbauer. The text retrieval and editing modes make this a very valuable piece of software.

Sometimes, however, the hobby computerist doesn't have all of the hardware required for a program like this. I have an alternative. As a beginning programmer (and aspiring freelancer) I wrote a very short program (mini-novel program, if you will) for my own use. Simply, I type in my text, edit now or later, save the text on cassette, and continue. Later, I print out my text and transpose from printer copy to manuscript quality.

Granted, the program does not deliver perfect copies on the printer; but it does enable a writer to save and edit his material on his computer. What more could you ask of a two-step program?

The program was developed for a TRS-80. Line 70 can be changed to: 70 PRINT A\$ for those without a printer.

```
10 CLEAR 255
20 INPUT A$
30 PRINT #-1, A$
40 GOTO 10
50 STOP
60 INPUT #-1, A$
70 LPRINT A$
80 GOTO 60
90 END
```

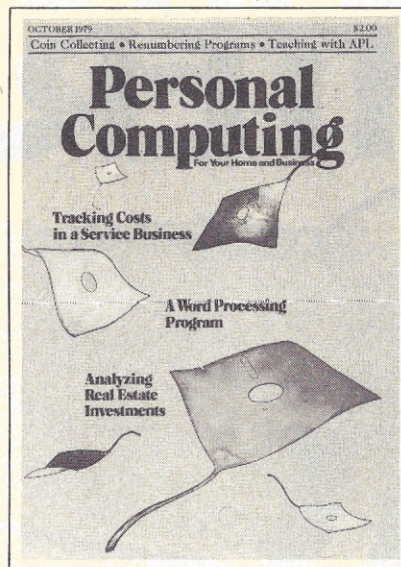
To save and edit text (up to 255 characters per entry), simply type RUN. Each time ENTER is keyed, your text is saved. Be sure to push RECORD on cassette player. To retrieve your text, simply type RUN 60 (cassette player on PLAY).

R.E. Langston
Hampton, VA

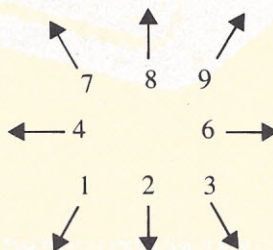
Maze Modifications

Dear Editor:

I thoroughly enjoyed "The Mino-taur's Malevolent Maze" in the



October issue. However, I offer the following modification for those people whose TRS-80s have numeric keypads. It allows the numeric keypad to be used in a pseudo-joystick fashion as shown in the following diagram.



If the new diagonal movements are not desired, they can be eliminated by deleting lines 5800, 5950, 6100 and 6200. See below.

```
5700 IF R < 49 OR R > 57 THEN GOTO 6250
5800 IF R = 49 THEN NT=N+63: GOTO 6250
5900 IF R = 50 THEN NT=N+64: GOTO 6250
5950 IF R = 51 THEN NT=N+65: GOTO 6250
6000 IF R = 52 THEN NT=N-1: GOTO 6250
6050 IF R = 54 THEN NT=N+1: GOTO 6250
6100 IF R = 55 THEN NT=N-65: GOTO 6250
6150 IF R = 56 THEN NT=N-64: GOTO 6250
6200 IF R = 57 THEN NT=N-63: GOTO 6250
6220 IF R = 53 THEN GOTO 8150
```

Keep up the good work.

Gerald D. Smith
Enid, OK

Family Tree Update

Dear Editors:

Any computer program, no matter how thoroughly gone over, can always be improved to correct errors of execution, to improve the flow and to implement the language involved in a better and more efficient manner. Such is the case with my article "Roots and Branches" (September 1979).

Historically, may I say that I labored over the program and its multitude of predecessors for about five months. During that time my progress was impeded by three main things.

First, there was not a renumbering feature to the disk BASIC nor was there a cassette tape renumber program available at that time. The programs as printed in your magazine were renumbered using a program appearing in your magazine that was adapted from the Pet for the TRS-80 (see March PC). This BASIC program took about 40 minutes to do the job. In contrast, the new disk BASIC, BASICR, from Radio Shack does the renumbering in a few seconds.

Second, glitches in Radio Shack disk BASIC version 1.1 and/or TRSDOS version 2.1 would unexpectedly cause rebooting of the operating system with subsequent loss of the BASIC program in memory. It was utterly frustrating to edit line after line to correct previous deficiencies in the program and then to have the disk run spontaneously with the DOS READY coming onto the screen with your program and all your changes being lost. Yet, the worst case for me was to have edited the program, to wait the 40 or so minutes for the renumbering to be done, save to disk under the same file name and in the middle of the save to get the DOS READY message, leaving me with no program available to work from at all. Since the disk save was incomplete, the original program on disk was now garbage. I became so gun-shy that I pulled out the cassette, CSAVED the program after editing, CLOAD'd to verify a good

save, renumbered using the BASIC program, CSAVED and CLOAD?ed again, and finally SAVED to disk. In this crude manner, I put together the programs. Radio Shack disk BASIC version 2.2 and TRSDOS version 2.2 now provide for recovery from a planned or unexpected booting of TRSDOS. My, how this would have saved me time and frustration!

Third, my understanding of BASIC in general and Radio Shack's BASIC in particular has been self-taught. Except for the Level I manual, no documentation that I have seen begins to inform you of the power of the language. So I

have gleaned tidbits here and there through seeing published programs of others and through experimentation. It still amazes me to see what can be done by combining FOR-NEXT loops with the IF-THEN-ELSE sequence. I suspect your readers have a multitude of other suggestions concerning better implementation of the language in the programs.

In the course of revising the programs for submission to your magazine, I incorporated into them some errors that prevent them from executing as explained in the text. Therefore, in order to correct these errors and also to

reduce unnecessary disk action, I suggest to your readers changes a. through t. in the TREE program. And to coordinate the ADDNAME program with the TREE program, I suggest changes u. through z. in the ADDNAME program. (See box below.)

Of course, many additional changes to improve the programs can be made. I'll leave those up to your readers.

I trust that these changes are not too overwhelming and I welcome your readers' comments and suggestions.

John J. Armstrong
Mobile, AL

Roots and Branches Corrections

a. place CLEAR8000 before DEFINT A-Z

Reason: CLEAR after DEFINT will disable DEFINT

```
30 CLEAR 8000:DEFINT A-Z:B1$=" ":B2$=" ":OPEN"R",L,"FAMILY"
```

b. change line 50, replacing C(28) with C(13), CH(28)

Reason: need two arrays, one for children #s and one for changes

```
50 DIM NL$(LOF(1)),NF$(LOF(1)),NH$(LOF(1)),C$(13),C$(13),CH(28)
```

c. change lines 310, 390, 470, 540, 620, & 770, replacing GOSUB1970:GOSUB2040 with GOSUB3410

Reason: reduce unnecessary disk action

```
310 FOR X1=1 TO LOF(1):IF NL$=NL$(X1) THEN X=X1:GOSUB3410 ELSE330
390 FOR X1=1 TO LOF(1):Y=INSTR(NF$(X1),NF$):IF Y=0 THEN X=X1:GOSUB3410 ELSE410
470 FOR X1=1 TO LOF(1):IF NH$=NH$(X1) THEN X=X1:GOSUB3410 ELSE490
540 FOR X1=1 TO LOF(1):X=X1:GOSUB3410
620 FOR X1=1 TO LOF(1):X=X1:GOSUB3410
770 GOSUB3410
```

d. change line 730 as shown

Reason: a RETURN is missing

```
730 IF X1<LOF(1) NEXT ELSE INPUT"CONTINUE":YH$:RETURN
```

e. change line 800 as shown

f. delete line 810

Reason: consolidate line 800 & 810

```
800 IF X2<LOF(1) NEXT ELSE INPUT"CONTINUE":YH$:RETURN
```

g. change lines 930 and 940, replacing X2 with X6

Reason: need unique variable

```
930 L1=480:IF CN=0 THEN950 ELSE FOR X6=1 TO CN:X4=C(X6):L1=480+(X6-1)*32
940 PRINT@L1,MID$(STR$(X6+13),2)*"NF$(X4)" "NL$(X4):NEXT:L1=L1+32
```

h(1). change line 1040, replacing C (X3) with CH (X3)

Reason: using separate change array

```
1040 INPUT"CHANGE ITEM # ":CH(X3):IF CH(X3)<1 OR CH(X3)>28 PRINTCH(X3)
15 AN INVALID ITEM # ":GOSUB1370:GOTO1040
```

h(2). change line 1070, replacing C(X3) with CH(X3)

i. change line 1070, replacing GOSUB numbers 1230 to 1340 with 1220

Reason: using separate change array and consolidating ON-GOSUBs

```
1070 ON CH(X3)GOSUB1090,1100,1110,1120,1130,1140,1150,1160,1170,1180,
1190,1200,1210,1220,1220,1220,1220,1220,1220,1220,1220,1220,
1220,1220,1220,1350,1360
```

j. change line 1080 as shown

Reason: consolidating disk action

```
1080 NEXT:PUTL X:RETURN
```

k. change lines 1090 to 1210 by deleting GOSUB1970 and PUT 1,X

l. change line 1120 by inserting SP(1)=CVI(S1\$) before GOTO1370

line 1160 by inserting SP(2)=CVI(S2\$) before GOTO1370

line 1210 by inserting CN=CVI(CN\$) before GOTO1370

line 1350 by inserting M=CVI(M\$) before GOTO1370

line 1360 by inserting F=CVI(F\$) before GOTO1370

m. delete lines 1230 to 1340

n. change line 1220 as shown

Reason: consolidating disk action and storing changes within the appropriate variables

```
1090 INPUT"BIRTH DATE (MMDDYYYY)":A$:LSET B0$=A$:GOTO1370
1100 LINEINPUT"BIRTH PLACE? ":A$:LSET P0$=A$:GOTO1370
1110 INPUT"DATE OF MARRIAGE (MMDDYYYY)":A$:LSET MD$(1)=A$:GOTO1370
1120 PRINT"SPOUSE ID NUMBER ":GOSUB1380:LSET S1$=MK1$(A)
:SP(1)=CVI(S1$):GOTO1370
```

continued


```

1130 LINEINPUT "MARRIED @ ? ";A$:LSET PM$(1)=A$:GOTO1370
1140 INPUT "MARITAL STATUS ";A$:LSET MS$(1)=A$:GOTO1370
1150 INPUT "DATE OF SECOND MARRIAGE (MMDDYYYY)";A$:LSET MD$(2)=A$:GOTO1370
1160 PRINT "SECOND SPOUSE ID NUMBER ";:GOSUB1380:LSET S2$=MKI$(A)
      :SP(2)=CVI(S2$):GOTO1370
1170 LINEINPUT "REARRIED @ ? ";A$:LSET PM$(2)=A$:GOTO1370
1180 INPUT "MARITAL STATUS ";A$:LSET MS$(2)=A$:GOTO1370
1190 INPUT "LIVING" OR DATE OF DEATH (MMDDYYYY)";A$:LSET DD$=A$:GOTO1370
1200 LINEINPUT "PLACE OF DEATH OR LIVING ? ";A$:LSET PD$=A$:GOTO1370
1210 INPUT "NUMBER OF CHILDREN ";CN:LSET CN$=MKI$(CN):CN=CVI(CN$):GOTO1370
1220 C4=CH(X2)-13:PRINT "CHILD #C4 ID NUMBER ";:GOSUB1380
      :LSET C4(C4)=MKI$(A):C4(C4)=CVI(C4(C4)):GOTO1370
1230 PRINT "MOTHER'S ID NUMBER ";:GOSUB1380:LSET M$=MKI$(A):M=CVI(M$):GOTO1370
1260 PRINT "FATHER'S ID NUMBER ";:GOSUB1380:LSET F$=MKI$(A):F=CVI(F$):GOTO1370

```

o. change lines 1990 to 2050 as shown

p. delete lines 2060 to 2090

Reason: consolidating disk action and field statements

```

1990 IF X<X0 GET 1,X:X0=X ELSE RETURN
2000 FOR C=13 TO 1 STEP -1
2010 FIELD 1,((C-1)*2+156) AS DUMMY$,2 AS C$(C):C(C)=CVI(C$(C))
2020 NEXT
2030 FIELD 1,8 AS B0$,24 AS B0$,8 AS B0$(1),2 AS S1$,24 AS PM$(1),9 AS MD$(2),
      2 AS S2$,24 AS PM$(2),8 AS MS$(2),8 AS DD$,24 AS PD$,2 AS CN$,2 AS M$,
      2 AS F$
2040 SP(1)=CVI(S1$):SP(2)=CVI(S2$):CN=CVI(CN$):M=CVI(M$):F=CVI(F$)
2050 RETURN
2100 '

```

q. change lines 2340 to 2810 by deleting GOSUB2040

Reason: consolidating disk action

```

2340 GOSUB1970:T=0:S(1)=SP(1):S(2)=SP(2):OF=CN:FOR AF=1 TO OR:OB(A$)=C(A$):NEXT
2370 GOSUB1970:T=T+5:GOSUB2830:OB=CN:FOR AB=1 TO OB:C1(AB)=C(AB)
      :NEXT:GOSUB2830:RETURN
2410 GOSUB1970:T=10:GOSUB2830:S1(1)=SP(1):S1(2)=SP(2):OC=CN
      :FOR AC=1 TO OC:C2(AC)=C(AC):NEXT
2450 GOSUB1970:T=T+5:GOSUB2830:OD=CN:FOR AD=1 TO OD:C3(AD)=C(AD)
      :NEXT:GOSUB2460:RETURN
2490 GOSUB1970:T=20:GOSUB2830:S2(1)=SP(1):S2(2)=SP(2):OE=CN
      :FOR AE=1 TO OE:C4(AE)=C(AE):NEXT
2530 GOSUB1970:T=T+5:GOSUB2830:OF=CN:FOR AF=1 TO OF:C5(AF)=C(AF)
      :NEXT:GOSUB2540:RETURN
2570 GOSUB1970:T=30:GOSUB2830:S3(1)=SP(1):S3(2)=SP(2):OG=CN
      :FOR AG=1 TO OG:C6(AG)=C(AG):NEXT
2610 GOSUB1970:T=T+5:GOSUB2830:OH=CN:FOR AH=1 TO OH:C7(AH)=C(AH)
      :NEXT:GOSUB2620:RETURN
2650 GOSUB1970:T=40:GOSUB2830:S4(1)=SP(1):S4(2)=SP(2)
      :OI=CN:FOR AI=1 TO OI:C8(AI)=C(AI):NEXT
2690 GOSUB1970:T=T+5:GOSUB2830:OJ=CN:FOR AJ=1 TO OJ:C9(AJ)=C(AJ)
      :NEXT:GOSUB2700:RETURN
2730 GOSUB1970:T=50:GOSUB2830:S5(1)=SP(1):S5(2)=SP(2)
      :OK=CN:FOR AK=1 TO OK:C8(AK)=C(AK):NEXT
2770 GOSUB1970:T=T+5:GOSUB2830:OL=CN:FOR AL=1 TO OL:C8(AL)=C(AL)
      :NEXT:GOSUB2780:RETURN
2810 GOSUB1970:T=60:GOSUB2830:RETURN

```

r. change lines 3140 to 3270 by deleting GOSUB2040

s. change line 3140 by replacing X1=X with X9=X

change line 3160 by replacing X=X1 with X=X9

Reason: consolidating disk action and using unique variable

```

3140 GOSUB1970:X9=X:GOSUB3150:RETURN
3160 T=0:X=X9:IF P0=1 GOSUB1970:GOSUB2830:NEXT:RETURN ELSE RETURN
3170 GOSUB1970:P1(1)=F:P1(2)=M:FOR P1=1 TO 2:X=P1(P1):IF X0 GOSUB3190
3190 GOSUB1970:P2(1)=F:P2(2)=M:FOR P2=1 TO 2:X=P2(P2):IF X0 GOSUB3210
3210 GOSUB1970:P3(1)=F:P3(2)=M:FOR P3=1 TO 2:X=P3(P3):IF X0 GOSUB3230
3230 GOSUB1970:P4(1)=F:P4(2)=M:FOR P4=1 TO 2:X=P4(P4):IF X0 GOSUB3250
3250 GOSUB1970:P5(1)=F:P5(2)=M:FOR P5=1 TO 2:X=P5(P5):IF X0 GOSUB3270
3270 GOSUB1970:P6(1)=F:P6(2)=M:FOR P6=1 TO 2:X=P6(P6):IF X0 GOSUB3290

```

t. insert line 3140 as shown

Reason: consolidating disk action

```

3410 IF (C1=1 OR C1=2 OR C1=3 OR C1=4) AND (C3=1 OR C3=2 OR C3=3 OR C3=4)
      AND C2=1 RETURN ELSE GOSUB 1970:RETURN

```

u. change line 140 by deleting PUT 1,X

v. change line 150 by deleting GET 1,x

w. delete line 170

x. change line 180 as shown

Reason: consolidating disk action and initializing disk variables

```

140 GOSUB410:GOSUB440:GOSUB470
150 GOSUB510
160 LSET B0$="????????":LSET B0$="?":LSET MD$(1)=BLANK$:LSET S1$=MKI$(0)
      :LSET PM$(1)=BLANK$:LSET MS$(1)="SINGLE":LSET MD$(2)=BLANK$:
LSET S2$=MKI$(0):LSET PM$(2)=BLANK$:LSET MS$(2)=BLANK$
      :LSET DD$="LIVING":LSET PD$="?"
180 FOR C2=1 TO 13:LSET C$(C2)=MKI$(0):NEXT:LSET F$=MKI$(0):LSET M$=MKI$(0)
190 PUT 1,X
200 GOTO60

```

y. change lines 530 to 570 as shown

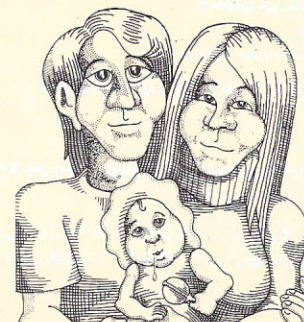
z. delete line 580

Reason: consolidating disk action and field statements to parallel TREE program

```

530 FOR C2=13 TO 1 STEP -1
540 FIELD 1,((C2-1)*2+156) AS DUMMY$,2 AS C$(C2)
550 NEXT
560 FIELD 1,8 AS B0$,24 AS B0$,8 AS B0$(1),2 AS S1$,24 AS PM$(1),
      9 AS MS$(1),8 AS MD$(2),2 AS S2$,24 AS PM$(2),9 AS MS$(2),8 AS DD$,
      24 AS PD$,2 AS CN$,2 AS M$,2 AS F$
570 RETURN
590 '

```





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Improving Income Property

Dear Editor:

There seems to be a computational oversight in the "Income Property Evaluation" program (January 1979). Line 480 $I4 = L4 \times R/100$ inadequately computes the total interest deductible. Presently the program calculates \$7862.50 for the first year. This seems to ignore any principal paydown, thus decreasing (however small) monthly interest payments. If an amortization

schedule is compiled at 9.25% for 30 years, the deductible interest for one year is \$7839.50.

This oversight can be modified and corrected by the addition of the following:

```
480 REM *** Calculate Yearly Interest
    (14)
481 REM * L5 = Declining Principal
```

```
482 REM * CI = Current Monthly Interest
```

```
483 L5 = L4 : CI = 0
```

```
484 FOR ZZ = 1 TO 12
```

```
485 CI = L5 * R/100/12
```

```
486 L5 = L5 - ((Int(100*M)/100) - CI)
```

```
487 I4 = I4 + CI
```

```
488 NEXT ZZ
```

This routine deducts the monthly principal payments, then amortizes the next month on the new principal.

In addition, it may be advantageous to round the Return on Investment to 3 decimal points, since a 9-1/8% mortgage would be 9.125. The return required by a prudent investor would be in such a form and we find that the current case rounded to three decimals is not 15% by 15.623%, a marked increase.

With respect to the IRS, the above would be more prudent.

David and Rod Mackenzie
Niagara Falls, Ontario

Author's Note: The suggestions from David and Rod Mackenzie will improve the accuracy of the deductible interest figure somewhat. Since all factors could not be considered in evaluating the return on investment percent (such as real estate appreciation and undetermined maintenance costs), this figure can only be approximate. Expressing the return to 3 decimal points would imply accuracy which does not exist and would be misleading. — Kimball J. Beasley

Applesoft Conversions

Dear Editor:

I especially enjoyed the August issue of *PC* and Rod Hallen's Decimal-Octal-Hex Number Conversion program. However, some of his PT BASIC syntax was not acceptable to my Applesoft II Floating-Point BASIC, written by Microsoft. Here for your readers, if they haven't already found them, are the fixes that worked for me.

```
Line 50: DIMension all subscripted
        variables, e.s. DIM A$(16),M(6).
Line 80: Change to PRINT:
        INPUT "BASE? "N$: PRINT
Line 180: Change to PRINT" = HEX "
        MID$(A$,H4+1,1);MID$(A$,H3+1,1);
Line 190: Change to PRINT MID$(A$,H2+1,1)
        MID$(A$,H1+1,1);
Line 220: Change to PRINT MID$(A$,Q6+1,1)
        MID$(A$,Q5+1,1);MID$(A$,Q4+1,1);
Line 230: Change to PRINT MID$(A$,Q3+1,1)
        MID$(A$,Q2+1,1);MID$(A$,Q1+1,1);
Line 500: Change to IF MID$(H$,K,1)
        = MID$(A$,J,1) THEN X=J-1: J=16
```

Because Applesoft II BASIC does not accept an argument after the RESTORE command, lines 570 through 660 should be changed. Use this fix:

```
570 Z=LEN(Q$)
575 S=0
580 FOR K=Z TO 1 STEP -1
590 M(K)=8^S
595 S=S+1
600 FOR J=1 TO 8
610 IF MID$(Q$,K,1)=MID$(A$,J,1) THEN X=J-1: J=8
620 NEXT J
630 D=D+X*M(K)
640 NEXT K: GOTO 300
650 DATA 1,16,256,4096
660 REM
```

These fixes should be adequate for all of us who enjoy computing to also enjoy Rod's program.

John L. Forbes
Snohomish, WA

TRS-80 City

Dear Editor:

I am new to your magazine, as well as computers, but I thought TRS-80 owners would enjoy this little satire on "City" (May 1979).

```
10 CLS: PRINTTAB (28) "CITY":
    PRINT:PRINTTAB(17)"AS
    DESIGNED BY A COMPUTER)
```

```
20 X=RND (62)+129
```

```
30 PRINTCHR$(X);
```

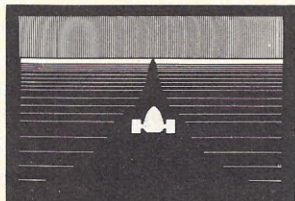
```
40 GOTO 20
```

J.D. Williams
Tampa, FL

What's NEW from **SOFTAPE**

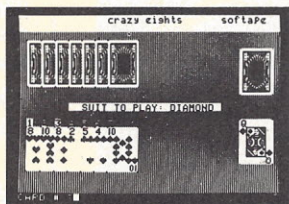
RACER

Slip behind the wheel, ignite the engine and get ready for a high speed race. RACER uses Hires and paddles to simulate Grand Prix excitement. Requires 24K.



CRAZY 8's

Crazy 8's is a card game using Bill Depew's HIREs playing cards. One player can play the APPLE. The beginner can select the option of seeing the APPLE's hand while playing. Crazy 8's is an easy to learn card game. Great for all ages. Requires 24K.

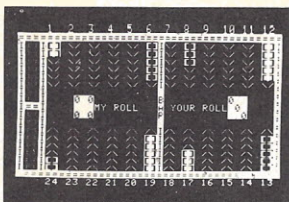


MICROGAMMON 1.0

Pit your mental skill and luck against that of the Apple with this computer implemented version of the popular board game Backgammon. All the moves are displayed on the video screen along with the board layout and pieces.

This program requires at least 16K of memory to run from cassette and 32K of memory to be stored and played from an Apple II Disk System. No additional hardware is needed.

Learn, practice, and enhance your Backgammon ability a true competitor. (To our knowledge, the Apple doesn't cheat!!!)



SOLITAIRE POKER

The ultimate poker machine! SOLITAIRE POKER simulates the poker machines that line the Las Vegas strip. Practice your poker ability with Hires playing cards. SOLITAIRE POKER is a sure winner! Requires 24K.



Two More By Steve Baker

GOMOKU

The ancient game of five men in a row. You play against a machine language routine with three levels of excellence. A Hires board using SCREEN MACHINE gives this game the beauty and style of chess. Requires 16K.

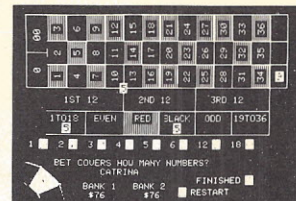
FIGHTER PILOT

It's war, and your mother ship is under attack. The adrenalin flows as you accelerate through the launch tube and penetrate the void of space. With all systems operating, your sensors show the direction of the enemy racing to meet you. After a few bursts he explodes, and you fly through his debris to meet the next one.

FIGHTER PILOT is a fast-moving game of excitement and skill. This graphics program, written in integer basic, requires 16K of memory.

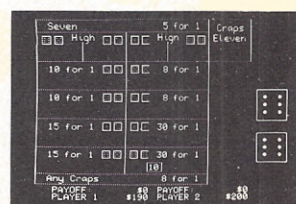
ROULETTE

Roulette is a realistic duplication of the popular casino favorite using HIREs graphics and a spinning wheel. Bets can be placed with the keyboard or you can use SOFTAPE's BRIGHT Pen. One or two players can bet against the house. Requires 24K.



CRAPS

Play Las Vegas Craps on a high resolution playing table created by your APPLE. Place bets, play the field, passline and hardway rolls... all are possible with this detailed simulation. Dice rolls are animated on the screen. Improve your game or devise your own "system". Craps requires INTEGER BASIC and 24K or memory. BONUS!! Included on the back side of the tape is Bright Pen Craps for those lucky guys with the SOFTAPE Bright Pen. You will be amazed how easily moves are made and how fast the game progresses!!



PRO GOLF

Now, even on rainy days, you can improve your game with PRO GOLF. With the Apple II as your caddy, you choose your own clubs and irons on each shot on this full 18-hole course. Every fairway has its own challenging sandtraps and water hazards, but distractions disappear when the screen displays only the green as you begin to putt. Your Apple-caddy keeps track of your score. Have fun, and remember... keep your eye on the ball!!

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Shifty Characters

Dear Editor:

Recently I was having trouble with my TRS-80 Level II. When I used the conditional "If...Then" for a YES or NO answer the program would always fall through the statement lines to the

next line. I had resorted to using 1=YES and 0=NO since, when I used numerics, the statements would always function properly. I knew it was my fault and not the machine, but after combing the manual thoroughly I was ready to call the toll-free number in Texas to try to get help.

Not wanting to look foolish, I

entered one last test program into the computer and ran it. It was then that I found out (and I have had the computer for more than three months) that a Shift variable is *not* the same as the variable. What I had been doing is typing in IF AS="YES" THEN... with the Shift key held down while I typed in "YES". Of course, when I entered the YES in answer to an input statement I would not use the shift key. Nowhere does the manual state that a Shift variable is different than a non-Shift variable.

I am sure there are hundreds of other little-known facts that computer owners have discovered.

If there hasn't been a deluge of such information, you could ask for it in the pages of *PC*. We readers would find such hints and tips very beneficial and rewarding.

Robert Kyle
Minneapolis, MN

Editor's Note: We've all run up against similar frustrations — a simple problem that could be easily solved with an insight, hint or suggestion from a more experienced programmer. So if you've got a tip, developed a technique or discovered a quirk in your machine, share your knowledge with other *PC* readers. Send your letters to Feedback, *Personal Computing*, 1050 Commonwealth Ave., Boston, MA 02215. We'll publish the most useful and most interesting letters. — D. W.



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Trucking On

Dear Editor:

I much enjoyed David Stockburger's article "Puzzler" (August) and I commend his extension of the idea to more complex situations.

I would like to point out, however, that the game Truck, which he finds so mysteriously without history or origin, has been around for a very long time. A version was even played by American Indians. It is called Solitaire. Traditionally, the board has 33 holes and 32 pegs, and the last peg should end in the middle position. The *Encyclopedia Britannica* has an article on it, and there is even a whole book written about it.

David Batty
Silver Spring, MD

CIRCLE 30

RANDOM ACCESS

A Community Computer Center

Apprehension people once felt toward computers is wearing off — especially in Marin County, California. There, the Marin Computer Center painlessly introduces residents into the world of computers. In a relaxed atmosphere, center visitors learn what computers are, how they work and what they can do. Over a dozen computers are available for public use, allowing people to become familiar with the machines at their own pace. The center is especially popular with children.

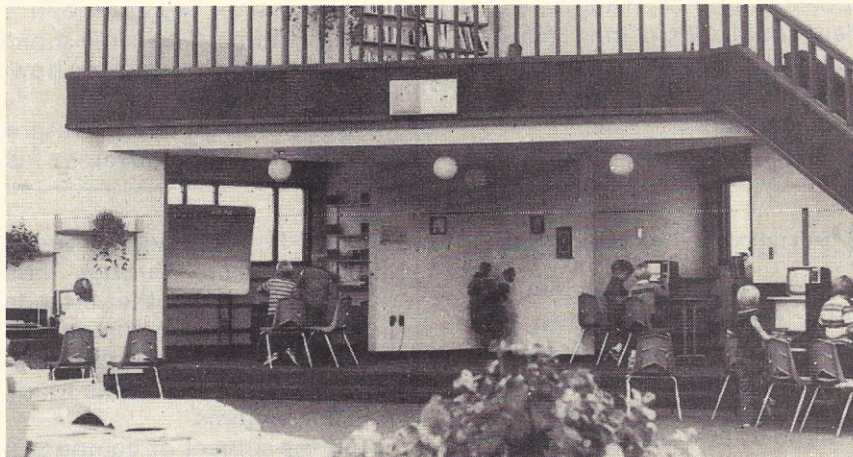
The idea for a computer center in this suburban San Francisco community originated with Annie and David Fox. They wanted to eliminate the "monster" image computers often have by introducing the machines to residents and informing them of the computer's capabilities.

With their goal in mind, the Foxes began developing the center. Equipment was ordered and a 5000 square-foot public library was rented. Announcements in local papers and on radio stations preceded the grand opening on September 10 and 11, 1977, which attracted a crowd of over 700 people.

Presently the center's equipment includes 9 Sol-20s, 2 Apples, a TRS-80, 2 Pets, a Video-brain and several peripherals. MCC's software library contains about 400 programs, with 95% falling in the game or recreational category.

Rates for using the center vary. Yearly memberships, offered on an individual, family, sponsored (family and one guest), sustaining (family and three guests) and business basis, range from \$12.50 to \$100. Rates for individuals and groups are available for non-members also.

According to Annie Fox, the center's current business has kept up with the original enthusiasm.



About 200 to 300 people attend MCC each week.

School field trips are very popular, says Pinky Case, Educational Consultant at the center. A minimum of 20 children or a maximum of 35 come for one and a half hours. The first half hour the children are given a talk on computer history. For the remaining hour they're free to use the computers, running any of the available programs. During 1978, 975 children visited MCC on school field trips. In the first six months of 1979, 720 children attended on trips.

Birthday parties are often held at the center. Parents rent the computers for one hour for ten children who pair off two to a machine.

Ms. Case says there are about 400 current members. Although the ratio of adults to children using the center is 50/50, more children attend on a one-time basis. Generally, interested adults will return to work on programs they're developing or to become more familiar with the machines.

During a typical visit to the center, a child comes in and picks out a program, which a staff member loads into the computer. The student has an hour to run it as many times as he/she wishes. Or, several programs can be played.

MCC also offers classes in beginning BASIC, for people 13 years and older, advanced BASIC, and a Pilot Programming course for children in grades four through eight. In the past two years, over 1000 people have enrolled in classes, said the Foxes.

The center has text editing equipment available for public use. Applications include thesis papers, reports and newsletters. In addition, MCC's computers, color video equipment and Advent video system can be rented on a daily basis.

In March 1979, the center received a \$20,000 grant from the San Francisco Foundation to develop other computer projects. Topics involved are: computer classes for children in remote areas; In-service training program for teachers; and of special interest, the Starship Simulation Project.

This school year, said Ms. Case, 14 schools will participate in the Outreach program. MCC staff members will help conduct 28, six-week classes at these schools, introducing the children to computers and teaching them fundamentals. School teachers are also given the opportunity to learn about computers so they in turn can teach their students.

The Starship project, still under

development, will simulate the computerized flight control deck of a starship. The deck, said the Foxes, will be equipped with six to eight microcomputers with graphics displays, each manned by a student with a specific responsibility. For instance, a student could control long and short range sensor scans, communications, navigation, maneuvering or engineering.

Realism is the key word, said

David Fox. Students should experience the thrill, adrenalin rush, realism, joy, fear and challenge a real crew might experience. To ensure realism, sound effects will be used, along with colored incandescent lighting, lasers, electric motors for vibration and a geodesic dome. The game should be challenging no matter how often it is played.

Several sub-groups are responsible for preparing different fea-

tures of the Starship, which include a story line, art and programming. When completed, the simulation will run like a ride lasting about half an hour.

For more information on these projects or the center, write the Marin Computer Center, 70 Skyview Terrace, Room 301, San Rafael, CA 94903; or call Annie and David Fox at (415) 472-2650.

— by Marjorie Morse

Privacy Problems

Concern that personal computer systems may lead to "buddy networks" and "data havens" at home was expressed in a privacy workshop at Asilomar, CA, sponsored by the American Federation of Information Processing Societies, Inc., (AFIPS) through a National Science Foundation grant. "Personal computer systems" was one area discussed at the workshop, which considered problems involved in protecting the confidentiality of information. "Data havens" refers to the collection of data without restrictions.

As suggested by Dr. Lance J. Hoffman, chairman of the AFIPS Special Committee on the Right of Privacy and organizer of the Asilomar workshop, previous kinds of regulation in areas outside of information processing are "child's play compared with the difficulties of imposing a 'Code of Fair Information Practices' on individuals using personal computers." Dr. Hoffman said it is conceivable that individuals using personal computers could be required to file a privacy notice concerning measures taken for the protection of personal data in their home systems. At present, the *Privacy Act* requires Federal Government agencies to provide such notice about the Government's personal recordkeeping systems.

According to another workshop participant, home computer systems could provide a message service which might compete with

the U.S. Postal Service as well as the private sector through "buddy networks". Another attendee noted that personal computer systems could pose problems if linked to bank electronic funds transfer systems.

On the subject of computerized criminal histories at the workshop, Dr. Alan F. Westin of Columbia University stated it is unlikely computers will be used to improve the criminal justice system. Dr. Westin doubted Congressional approval of a nation-

wide exchange of computerized criminal histories was likely. He foresees such an exchange through a state consortium instead of the Federal Bureau of Investigation, as is now the case.

The results of the AFIPS workshop are contained in a forthcoming book, entitled *Computers and Privacy in the Next Decade*, to be published by Academic Press (under the auspices of the AFIPS Special Committee on the Right of Privacy) late this year.

Education Foundation

Apple Education Foundation, a non-profit organization initially funded by Apple Computer, will offer support and resources to organizations and individuals who are pioneering learning methods through the use of microcomputers. The foundation will distribute hardware for both developmental and demonstration projects involved in projecting instructional computing materials. In addition, a few funding grants will be available for educational enrichment projects.

Gregory Smith, executive director of the foundation, said, "The microcomputer revolution has proven that computers belong in the classroom, both to teach computer science — a vital knowledge for students growing up in a computerized society — and to enhance the learning process with computer assisted instruction. The foundation's primary goal is to place hardware

into the hands of people who will further those educational methods which take best advantage of the personal microcomputer's capabilities."

The foundation will also sponsor the Education Program Information Center. EPIC will support microcomputer users in developing new instructional programs and in obtaining available information on educational materials. The center will publish information packages containing design and development guides, editorial and marketing guidelines, and software techniques. Authors may submit their work to the center for review and feedback on the most effective uses and placements of their materials, said Dr. Richard Ballard, manager of EPIC.

You can contact both the Apple Education Foundation and EPIC at Apple Education Foundation, 20605 Lazaneo Drive, Cupertino, CA 95014.

Computer Unclogs Taiwan Port

A new "harbor master" is at work in Kaohsiung, Taiwan, a bustling port where at one time hundreds of ships lay at anchor for weeks waiting to unload cargo.

Now 15,000 ships a year stream into harbor to unload, reload and be serviced without any noticeable or reported delays. And in the warehouses and business offices of the Kaohsiung Harbor Bureau the paperwork and communications associated with such an operation moves smoothly and on time.

The new harbor boss is a real-time management information system that has turned this once chaotic port into an efficient operation. Manual, paper-based methods for handling ship schedules, cargo destinations, warehouse locations, billing and other activities have been replaced by a network of communications terminals linked to a large-scale computer system that stores up to 714 million characters of information.

KHB Commissioner L. S. Lee spearheaded automation of harbor activities with a Control Data 3150, which since has been upgraded to the current CDC Cyber 72. Cargo vessels now experience little delay in receiving berth assignments, said Lee. In addition, customer billing and payment services have improved and KHB officials have daily, weekly, monthly and "upon demand" status reports on harbor traffic, projected workloads, manpower and equipment availability and warehouse space.

Ranked as the tenth largest port in the world, Kaohsiung Harbor handles more than 39 million tons of cargo annually, said Control Data. In 1979 its revenues amounted to over \$47 million. It employs 3400 persons and has millions of dollars invested in warehouses, cranes and vehicles. Plans are now being developed to make Kaohsiung the largest cargo distribution center in the Far East, exceeding Hong Kong and Singapore in volume of traffic, according to Control Data.

The basic computer system

configuration includes three 844 disk drives, four tape units, a card reader and printer. Linked to it is the CDC 2550 communications processor that includes 25 CRT terminals and 30 printers installed in various harbor operations offices.

In addition to traditional business applications — personnel, accounting and payroll — KHB's computer applications assist in harbor traffic, loading and unloading and warehousing.

Information on ships heading for Kaohsiung port is entered on the terminal in the harbor operations controller's office. This includes ship identification data, type and amount of cargo and any supplies and services requested by the ships.

From this information, the Cyber 72 assigns pilots and tugs and makes berth assignments. As the ships are unloaded, reloaded and serviced, information on each is entered on the controller's terminal for processing into

stevedore charges and other billings. When the ship clears harbor, that information is also entered into the computer. The cargo handling system gives KHB management a number of statistical and analytical reports that immediately tell them the efficiency level of harbor activities and where improvements can be made.

Allocation of warehouse space is made by the computer, based on shippers' requests. When cargo arrives at the designated warehouse, essential data concerning it is entered on a terminal there and updated whenever some activity affects its status. When the cargo is released from the warehouse, that information is entered on the terminal and the computer generates the appropriate billing materials.

Lee said an average of 7000 transactions are relayed to the computer each day from terminals throughout the harbor area.

Computers in the Humanities

At a recent Dartmouth conference, "International Conference on Computers in the Humanities", a Canadian government official, Alain Landry of Ottawa, told of governmental efforts to use computers in solving communications problems in his bilingual nation. Computers are now programmed to help harried government officials select terminology when translating documents from French to English and English to French.

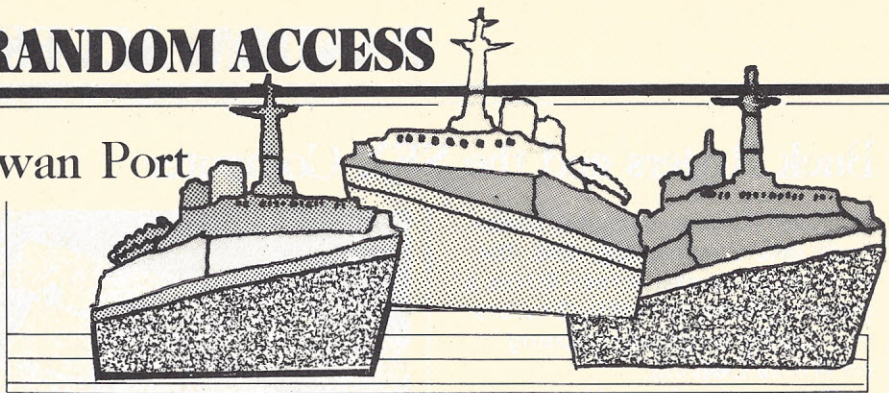
A report by Robert Danziger of the University of Mannheim on computerized election samplings in West Germany informed the conference that that nation

is now becoming even more obsessed with election polling than the U.S.

Thomas Ohlgren of Purdue University reported on cataloging icons with the aid of computers. Even minor and nameless characters in large paintings are listed through descriptions of their actions or appearances. Procedures for cataloging British art were described by Mary Jane Sobinsky of Yale's British Art Center.

Also discussed were such varied subjects as computerized storing of the Sioux Indian language and computerized analysis of the history of the London theater.

Illustration by Dolores Brandow



Buck Rogers and the SFX Computer

As Buck Rogers whips his spacecraft into a screaming dive, the cockpit computer screen traces a glowing image in brilliant colors — a deadly pirate ship closing in on Wilma Deering!

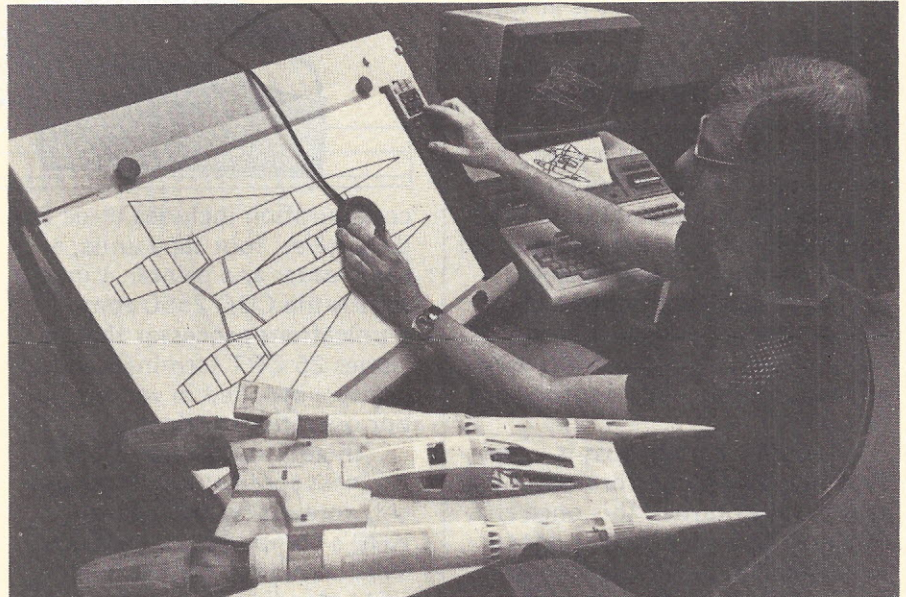
This scene from Universal Studio's film *Buck Rogers in the 25th Century*, which was also the pilot for the fall television series, combines special effects with pictures drawn by a computer. Colin Cantwell, a computer graphics consultant, programmed a Hewlett-Packard System 45 desktop computer to create the images appearing on Buck's tactical cockpit display.

Color was added by special effects (SFX) techniques, Cantwell explained. First, the System 45 drew a separate picture for each color, and paper copies were printed on the computer's built-in printer. Then, photographic negatives showing the spacecraft as clear lines on a black background were produced. Next, the negatives were placed on an animation stand and filmed through colored filters. To complete the process, the final pictures were combined to create the images as they appear on Buck's cockpit screen.

Cantwell says that computer-drawn pictures are also solving problems behind the scenes in the motion picture industry. The program that drew the cockpit displays was developed to aid planning and shooting complex special effects for Buck Roger's battles in space.

According to Cantwell, productions like *Buck Rogers*, *Star Wars* and *Close Encounters of the Third Kind* rely on computer technology to control model movements. In *Close Encounters*, for example, a camera followed actor-scientists as they were supposedly "buzzed" by UFOs. Months later, technicians guided by a computer reproduced the camera's motion on a special effects stage, and the UFOs were added to the scenes.

The movements in Buck's



space battles were especially difficult, involving many ships in realistic "dogfights." Once a scene was choreographed, each spacecraft had to be shot separately. To control the motion of each ship, the stage crew slowly built up a computer record of its maneuver, one axis at a time. Long exposure times were necessary, and the motion control system took several minutes to photograph a two-second move. The briefest scenes required hours, or even days, to complete.

"Trial and error on the shooting stage is expensive and frustrating," Cantwell said. "The main problem is knowing where to move the model and camera on the motion control stage to get the correct result on the screen," he said.

Cantwell's computer-assisted special effects system was the result of an experiment. One weekend he borrowed a Hewlett-Packard System 45 desktop computer. His goal was to lay out a three-dimensional space scene with the System 45 drawing the picture. By Sunday evening the test program was finished. Within an hour the computer had printed out 60 drawings of spacecraft, each portraying accurately what the camera would see.

The program was expanded

when an HP system was delivered to Universal Studio's Hartland Special Effects Facility. To use the program, an operator first specifies spacecraft type and where the ship should appear on the computer screen. Next, the operator tells the computer what the ship's size and attitude should be, as well as what camera lens will be used. The computer then draws the ship as it would appear to the camera. If the operator wants to change to a different lens, or even move the model, the computer will quickly redraw the image on the screen. Once satisfied, the operator can print out a permanent copy of the screen display by using the computer's built-in printer. In addition to the drawing, the paper copy includes information for positioning the models correctly on the shooting stage.

Until recently, operators had to type in numbers describing spacecraft position; now, an HP 9874 digitizer simplifies the process. The digitizer, which looks much like an ordinary drawing board, senses the position of a hand-held stylus and sends this information to the computer. Now the operator can input angles and distances directly, and the computer figures out the numbers.

RANDOM ACCESS

Today, Universal's new motion control system uses HP magnetic tape data cartridges for permanent storage of the complex moves. When complete, the system is planned to be compatible with the HP System 45.

"Now that desktop computers are capable of executing computer graphics, it's only a matter of

time before movie directors will be checking their camera angles on a computer while the set design is still on the drawing board," predicted Cantwell. "Computers that draw pictures will be an essential tool in the motion picture industry."

Cantwell's efforts on past films include work as animation direc-

tor for *2001: A Space Odyssey*, supervisor of spacecraft design and prototype model construction for *Star Wars*, supervisor of technical dialogue for *Close Encounters of the Third Kind* and designer and director of numerous films for the U.S. National Aeronautics and Space Administration.

Commodities Exchange Hatches New Idea

Long ago, farmers traveled miles to take their eggs to market. They would wait through long hours of selling and trading before making the journey home. Today, there is a service that puts up-to-the-minute egg trading information at the marketers' fingertips.

Through a Texas Instruments Silent 700, Model 765 Portable Bubble Memory Data Terminal, egg marketers are buying, selling and obtaining past and current egg market information in printed form as the market changes, minute-by-minute. At Egg Clearinghouse in Durham, NH, where eggs are traded nationwide, minutes can make a difference.

"We have 275 members that operate 375 plants throughout the country and represent 40 percent of the egg production in this industry," said Steve Blain, Director of Computer Programs at Egg Clearinghouse. "In the past, members had the information relayed to them verbally over the phone. By the time they obtained information in seven categories they either sometimes forgot it or wrote it down wrong. With TI's 765 they have instant, accurate information in printed form."

When making a bid, members use the Bubble Memory terminal to enter their code number, their bid to sell or offer to buy, the weight category, number of cases, price, the delivery schedule, the number of loads and freight cost.

It is crucial to have ready, accurate information during trading sessions, where bids and offers change rapidly. When the

members are ready to make their offer to buy or sell, trading data is transmitted within seconds using the built-in acoustic coupler over normal phone lines. The bids are then entered onto the trading board.

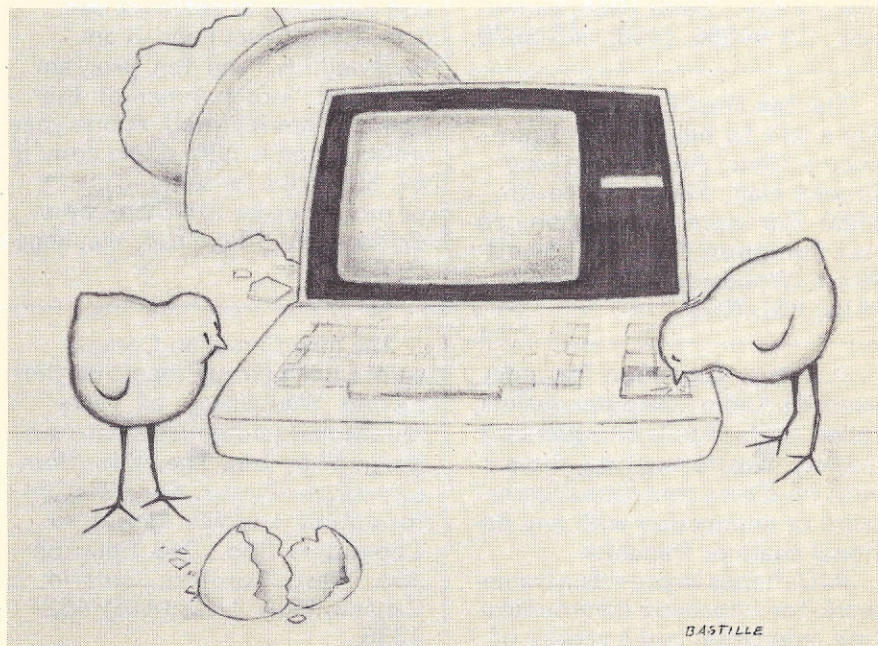
Since Egg Clearinghouse serves as the "Wall Street" of the egg trading industry, members must keep up with pricing trends. With the 765's bubble memory, members can index market information on previous buys and sales and can retain past trading action to determine the trend and better establish their bids.

TI's terminal can collect and store up to 80,000 characters (16 to 20 typewritten pages) and retains data for as long as desired, even when the power is off. Members access and print out their indexed and current infor-

mation for use in trading decisions at 30 characters per second with the thermal printhead.

Egg Clearinghouse has a morning and an afternoon trading session each day. During the first hour members transmit the bidding data that is entered on the trading board. Then, members use their 765s to see what's on the board from other areas, make adjustments and do their trading. During the following "wild card" session, members not on the board can use the 765 to see what others have done and at this time join in on the trading.

"As we do more and more trading, the whole country will begin to trade in both the morning and afternoon sessions," Blain said, "which will increase our members' need to have current and indexed trading information readily accessible."



RANDOM ACCESS

☆☆☆ Announcements ☆☆☆

HUG Northshore, a club for Heathkit computer users (H8, H11, ET3400), provides a forum for exchanging ideas, programs and knowledge. The club meets the second Wednesday (7 p.m.) of each month at the Hill Tech Building, 88 Holten Street (3rd floor), Danvers, MA 01923. For a free copy of the club's monthly newsletter write HUG Northshore, PO Box 112, Danvers, MA 01923.

Home computers, video tape recorders and video cameras, giant-screen TV and video games will be featured at the Home Entertainment Show, Brooks Hall, San Francisco, September 19, and 21, 1980.

Open to the general public, the show is sponsored by the non-profit Consumer Electronics Division of the Northern California Chapter of the Electronic Representatives Association.

The show includes live performances, consumer-oriented seminars and special attractions. Admission will cost \$5.

For more information contact Ginger Taylor, Show Director, Cartlidge & Associates, Inc., 491 Macara Ave., Suite 1014, Sunnyvale, CA 94086; (408) 245-6870.

The 5th West Coast Computer Faire will be held in San Francisco's Civic Auditorium and Brooks Hall, March 14 to 16, 1980. For more information contact Computer Faire, 333 Swett Road, Woodside, CA 94062; (415) 851-7075.

A new organization for independent Apple Computer dealers, called AIDs (Apple Independent Dealer), was formed for dealers with no direct contractual agreement or connection with any national chain or franchise.

AIDs hopes to provide a framework for improved communication, education and a variety of

support to its members including sharing new software and hardware information, successful marketing and problem solving, advertising ideas and more. AIDs' newsletters will provide individual dealers with a voice and many ears, allowing communication with the mainstream of the industry.

Those who do not qualify as members but have a justified interest in AIDs can request an associate membership. Full membership for qualified dealers is \$35 per year, with a \$15 initiation fee for new members. For more information contact Harry M. Sweeney, President, at (503) 228-5242, or send an S.A.S.E to AIDs, PO Box 06126, Portland, OR 97206. Make checks payable to AIDs, a nonprofit organization.

A new quarterly publication, *80 Software Critique*, is a collection of reviews on TRS-80 cassette software. All programs are rated on a 0 to 100 scale. Programs reviewed include games, simulations, educational programs and music programs. No business software is included.

Issue #1, now available, contains 50 reviews along with names and addresses of software vendors. Both Level I and II are reviewed. A "top ten program list" and "programmer of the quarter" are featured. A one year subscription is \$24; single copy is \$7. Subscribe by sending check or money order to *80 Software Critique*, P.O. Box 134, Waukegan, IL 60085.

The new Canadian Compucolor User's Group meets on the second Wednesday of every month and invites users and "on-lookers" to join. The club offers a program library. For more information contact House of Computers, Inc., 368 Eglinton Ave. West, Toronto, Ontario, Canada, M5N 1A2; (416) 482-4336.

The joint meeting of the American Association of Physics Teachers and the American Physical Society, held at the Chicago Marriott Hotel, January 21 to 24, 1980, will offer sessions dealing with microcomputer instrumentation. Sessions include:

- workshop on "Introduction to Microprocessors"
- workshop on Pascal
- hands-on session on "The Use of Personal Computers in Learning Physics"
- sessions with contributed papers on computer and instrumentation topics

For more information contact the American Association of Physics Teachers, Graduate Physics Building, SUNY at Stony Brook, Stony Brook, NY 11794, Attn: Joint Meeting; (516) 246-6840.

The Compucolor-Intecolor User's Group is an international group consisting of professionals at Universities and companies. The club publishes a quarterly bulletin and has a program library. Membership allows users to buy Compucolor and Intecolor equipment at a discount through mail order. A year's membership costs \$30. Foreign subscriptions add \$10. For more information contact Compucolor-Intecolor Users Group, 5250 Van Nuys Blvd., Van Nuys, CA 91401.

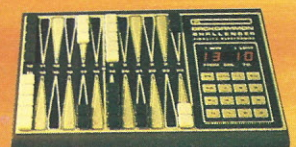
Computer Science Systems has announced the grand opening of four TRS-80 stores during the end of this year. The stores will be located in San Antonio, Dallas, Houston and Hidalgo, TX. The store at 1035 Majestic Building in San Antonio is already open. These stores feature accounting programs as well as games and advice.

For more information on the stores contact Computer Science Systems, Majestic Building, Suite 1035, San Antonio, TX 78205; (512) 224-5433.

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Other challenging computer games from Fidelity include...BRIDGE...CHECKERS...and BACKGAMMON. At fine stores everywhere.



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The world's largest manufacturer of self-contained, microprocessor based, board games.

Part 2

Holiday Buyer's Guide

BY THE EDITORS

As the holiday season approaches, thoughts turn to gift ideas for friends and family. For the computerists on your list — including yourself — what better gift than a computer book, board, peripheral, accessory or even a complete system?

This article — the second of two parts — takes a look at some computer-related products covering a range of prices to suit a range of holiday budgets. Last month's article examined software; this month, we'll look at systems, peripherals, boards and other items. (You'll find still more products in our What's Coming Up department — both this month and in past issues.)

If you're buying by mail, be sure you get your orders in early to avoid the holiday mail rush and to insure you receive your merchandise in time. Also, exercise caution in dealing with mail-order firms. Outright frauds are rare, but legitimate companies sometimes face legitimate difficulties in delivering products. And, unless you do some checking first, you may find the product delivered does not live up to your expectations. Be sure you know what you're buying and the basis on which you can return it for a full refund. You want to buy a source of pleasure and enjoyment — not a source of ulcers and coronaries.

Computer Systems

If you're looking for exciting home entertainment that will continue long after Christmas, the Bally Computer System might be just the thing. It comes with three built-in arcade games (Checkmate, Gunfight and Scribing) and there is a wide variety of optional video cassettes available which offer sports, strategy and educational games. The unit can also serve as a 5-function,

10-memory calculator with scroll button and entry correction for reconciling bank statements or performing other tasks.

For those who would like to go slightly beyond pre-programmed game fare, Bally offers "Bally BASIC", a self-teaching computer programming cassette containing an extended version of BASIC which allows the user to create short programs. Personally written programs are entered by means of the computer's keypad using a two-stroke system which converts the numeric keypad into alphanumeric mode. Color-coding enables each key to have multiple functions.

Bally BASIC includes a music synthesizer with a 3-octave range. Keypad numbers correspond to musical notes so "play by number" songbooks can be followed or you can create original compositions and play them electronically. A companion to the BASIC cassette is the Audio Cassette Interface which allows you to connect the system to any audio cassette tape recorder for permanent storage on tape of all Bally BASIC programs. The full color range of television sets (256) colors is available for video artists.

The Bally Computer System comes in a two-player version with a suggested retail price of \$299.95 and a four-player version with a price of \$329.95. The system is distributed through a number of retail outlets including computer stores, specialty electronic stores, TV and appliance outlets and retail department stores.

Atari, Inc., one of the nation's leading manufacturers of computer-controlled games, recently entered the personal/home computer industry with the Atari-400 general purpose system and the Atari-800 specialized system.

The 400 is a full-fledged general purpose computer that connects to any TV set and performs practical functions such as business and household management, educational applications and entertainment. The educational system allows you to simultaneously see and hear instructions, then respond at your own pace. A library of applications contains over 20 subject areas.

Applications are available either on plug-in cartridges or cassette tapes; or you can design, write and store your own computer programs in BASIC. Memory for the system is 8K RAM and 8K bytes of ROM expandable to 16K bytes with user-installed cartridge programs.

Optional equipment for the 400 includes a custom designed tape recorder, a printer for program listings and records, joystick, paddle and driving controllers and a wide variety of pre-programmed software.

The Atari-800 brings even more power to personal computer users with its user add-on memory. As your computer needs become more complex, you can plug one to three memory modules into the 800 console and instantly expand the system's memory from 8K bytes of RAM up to 48K bytes. The 800 is shipped with 8K of internal ROM and 8K of ROM in the BASIC cartridge. ROM cartridge slots (2) allow expansion to 32K.

As with the Atari-400, the 800 has a wide variety of pre-programmed applications on cartridges or tapes that include personal financial management, record keeping, charge account management, inventory, accounts payable, capital investment and others. Educational subject areas range from algebra to zoology and games vary from thinking games such as chess and

The body's beautiful, but you'll love your Companion for her mind!

INTRODUCING THE PERSONAL GENIE: COMPANION I & II

Beneath her beautiful teakwood roll-top desk exterior, there beats a heart of pure Radio Shack TRS-80 Microcomputer.

But don't let her good looks fool you. Your Genie has a brain that's right at home in your office, home, classroom or laboratory.

Two versions are available, each designed around the TRS-80 system with video monitor, keyboard, cassette recorder, expansion inter-face, mini-disk system and printer.

Both include the latest version of the TRS-80 disk operating

system, disk BASIC and Level II BASIC as well as the assurance of Radio Shack's reputation, warranty and national service network.

The Companion I features 16K of memory, the TRS-80 Quick Printer I and a single mini-disk drive.

The Companion II highlights include 32K of memory, the TRS-80 tractor feed line printer and dual mini-disk drives.

Either version can be expanded to accommodate additional memory and mini-disk drives.

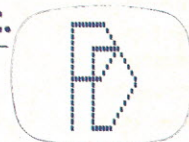
And we haven't forgotten her brain food either. A full set of cassettes, diskettes and paper

accompanies the clear and concise instructions of the Companion User's Manual. All this brain matter comes pre-assembled in a body you can love and live with.

The perfect Companions from PRODATA.

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Systems*



Companions I & II are competitively priced at \$3,495 and \$4,995 respectively, FOB Ft. Worth, Texas, and ready for immediate delivery. PRODATA will pay the air freight charges on all prepaid orders within the Continental U.S.A. For more information call Toll free 800-367-7050 Ext. 1811 or write PRODATA, Inc. 98-1122 Kahapili Street, Aiea, Hawaii 96701, Telephone 808-488-5348. Assembly Office: 3620 Lake Pontchartrain Drive, Arlington, Texas 76016.

backgammon to action entries like four-player basketball and breakout.

The 800's family of peripheral components includes a program recorder (supplied with the system), an optional disk drive capable of 92K bytes of storage on each floppy diskette and expandable to four drives, and an optional printer.

Both models utilize a 6502 microprocessor in addition to three custom chips designed by Atari for graphics, sound synthesis and keyboard interchange.

Suggested retail price for the Atari-400 is \$550 while the 800 costs \$1000. The disk drive retails for \$750, the

playback, built-in microphone jack, cartridge connector, and internal operating system and a BASIC interpreter. It includes color graphics, which at high resolution consist of 128 by 192 characters with up to eight color variations.

The company said its dual track tape player is built in so it completely eliminates tape loading hassles and allows voice recording on the second track so you can talk or add sound effects to your programs. The machine is also programmable in BASIC.

Software for the unit expands on programs already developed for the company's video game unit and includes newly developed applications

The Professional is designed for those who require a peripheral interface for connecting a line printer to the computer to produce hardcopy. The Professional-Plus adds Level II BASIC in ROM, which frees memory space for the user who wishes to write large programs. The company said the Standard offers the first-time user an affordable, easy-to-use entry into the computer field.

Built-in features include 16K RAM, 2K ROM, 8080A microprocessor, cassette deck, 53-key keyboard, two entertainment-controller ports and power cord. Attachments are an eight-foot TV connector cord and TV switchbox.

In addition to the Model One Standard features, the Professional also provides a 2-port RS-232 printer and communications interface while the Professional-Plus comes with an additional 14K ROM with the Level II BASIC, a program editor and communications software.

Programmers have already created education, entertainment and personal finance programs, which are entered via the built-in cassette. Most program tapes sell for less than \$15 when purchased separately and there are program packs for savings on groups of tapes.

Retail prices for the versions are: Professional-Plus, \$700; Professional, \$600; and the Standard, \$500.

The Apple II Plus is an enhanced, upgraded version of the Apple II. Several new features make the computer easier to use — a definite plus for business and education applications.

For example, Applesoft Extended BASIC is available in ROM on the Apple II Plus. Earlier Apple IIs featured Integer BASIC, a fast language suitable for graphics and games but too limited for more serious applications. If you wanted to run Applesoft, you had to load a tape or buy a \$200 plug-in firmware card.

Applesoft Floating-Point BASIC, written by Microsoft, is comparable to other Microsoft BASICs. It features 9-digit arithmetic, high-resolution graphics routine and user-programmable error messages. Three data types are available — real, integer and string — as well as N-dimensional arrays and N-letter variable names (with only the first two letters significant). Scientific



Bally Computer System, an entertainment-oriented unit, retails for \$299.95.

printer for \$600 and the recorder for the Atari-400, \$90. Software varies from \$35 to \$70. Atari products are available from retailers across the country.

"Your life will never be the same," APF Electronics said in announcing its Imagination Machine, a unit that combines a personal computer with a sophisticated home entertainment center. Software available covers games, home management, education and simulations.

APF has taken its MP-1000 video game, which hooks up to existing televisions, and added the MPA-10 computer console to create the IM-1, a personal computer that is expandable to include disks, printers and telephone modem. Standard features include 10K ROM and 9K RAM, typewriter keyboard, two game-style controllers, a 32 characters by 16 line screen format, six function built-in cassette tape deck, digital and audio information record/

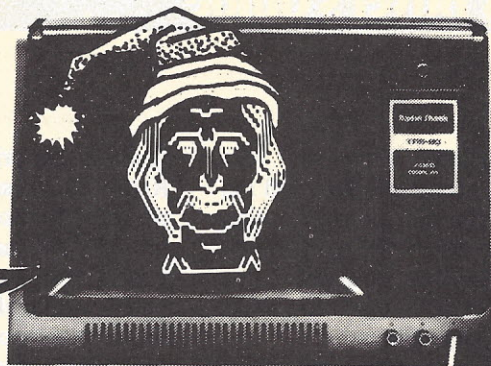
like a math tutor which uses "timed response monitoring." The computer looks at how long it takes you to answer a problem and automatically adjusts the skill level to your ability. A typing tutor program works the same way. Additional programs for the Imagination Machine are being developed constantly, the company said.

Suggested retail price for the unit is \$500.

Interact Electronics is offering three versions of its Model One Computer: Professional-Plus, Professional and Standard. The company has tailored the three systems to meet a wide range of consumer needs and level of expertise. Professional and Standard models can be upgraded at any time.

All versions use the same 16K memory processor but each combines different accessories and attachments to satisfy both the first-time user and the more sophisticated computer hobbyist.

GIVE YOUR TRS-80 A LITTLE CHRISTMAS PACKAGE. (YOU'VE EARNED IT!)



Graphic
Drawing
Done
On
The
TRS80
Using
"The
Electric
Artist"
Program!

GRAPHIC-TREK "2000"

This full graphics, real time game is full of fast, exciting action! Exploding photon torpedoes and phasers fill the screen! You must actually navigate the enterprise to dock with the giant space stations as well as to avoid klingon torpedoes! Has shields, galactic memory readout, damage reports, long range sensors, etc! Has 3 levels for beginning, average, or expert players!

INVASION WORG

Time: 2099 Place: Earth's Solar System Mission: As general of earth's forces, your job is to stop the Worg invasion and destroy their outposts on mars, venus, saturn, neptune, etc! Earth's Forces: Androids — Space Fighters — Laser Cannon — Nuetrino Blasters! Worg Forces: Robots — Saucers — Disintegraters — Proton Destroyers! Multi level game lets you advance to more complicated game as you get better!

STAR WARS

Manuever your space fighter deep into the nucleus of the Death Star! Drop your bomb then escape via the only escape route. This graphics game is really fun! May the force be with you!

SPACE TARGET

Shoot at enemy ships with your lazer gun. If they eject in a lifeboat vehicle, capture them, or if your cruel, destroy them! Full graphics, real time game!

SAUCERS

This fast action graphics game, has a time limit! Can you be the commander to win the distinguished cross! Requires split second timing to win! Watch out! The saucers fight back!

Package One — \$12.95

CHECKERS 2.1

Finally! A checkers program that will challenge everyone! Expert as well as amateur! Uses 3-ply tree search to find best possible move. Picks randomly between equal moves to assure you of never having identical games. Computer also makes sly remarks about the game!

POKER FACE

The computer uses psychology as well as logic to try and beat you at poker. Cards are displayed using TRS-80's full graphics. Computer raises, calls, and sometimes even folds! Great practice for your Saturday night poker match!

PSYCHIC

Tell the computer a little about yourself and he'll predict things about you, you won't believe! A real mind bender! Great amusement for party's.

TANGLE MANIA

Try and force your opponent into an immobile position. But watch out, their doing the same to you! This graphics game is for 2 people and has been used to end stupid arguments. (And occasionally starts them!)

WORD SCRAMBLE

This game is for two or more people. One person inputs a word to the computer while the others look away. The computer scrambles word then keeps track of wrong guesses. Can you make less mistakes then your adversary?

Package Two — \$12.95

POETRY

This exciting and sometimes funny program lets you choose the subject as well as the mood of the poem you want. You give TRS-80 certain nouns or names, then mood, and he does the rest! TRS-80 will write different poetry about one subject forever if you let him. Has a 1000 word + vocabulary of nouns, verbs, adjectives, adverbs!

ELECTRIC ARTIST

Written by a working artist and a computer engineer to make drawing on the video screen easier then picking up a pencil! (Less messy too!) Manual: Draw, erase, move as well as, Auto: Draw, erase, move. Uses graphics bit's not bytes. Graphic face in ad done using this ingenious program!

GALACTIC

BATTLE

The Swineus enemy have long range phasers but cannot travel at warp speed! You can, but only have short range phasers! Can you blitzkrieg the enemy without getting destroyed! Full graphics — real time!

WORD MANIA

Can you guess the computers words using your human intuitive and logical abilities? You'll need to, to beat the computer! He keeps score and gets mad if he loses!

AIR COMMAND

Real time, graphics Flight Simulator! Land, take-off, get out of a spin! Be careful not to stall! Watch your fuel gauge! Requires a clear headed pilot.

Package Three — \$12.95

LIFE

This Z-80 machine language program uses full graphics! Over 100 generations per minute make it truly animated! You make your starting pattern, computer does the rest! Program can be stopped and changes made! Watch it grow!

REAL TIME LANDER

This full graphics simulator lets you pick what planet, asteroid or moon you wish to land on! The "Live" keyboard gives super response that gives you the feeling of being in command! Has 3 skill levels that make it fun for everyone.

GREED II

Multi-level game is fun and challenging! Beat the computer at this dice game using your knowledge of odds and luck! Computer keeps track of his winnings and yours. Quick fast action. This game is not easy!

THE PHARAOH

Rule the ancient city of Alexandra! Buy or sell land. Keep your people from revolting! Stop the rampaging rats and locusts! Requires a true political personality to become good!

ROBOT HUNTER

A group of renegade robots have escaped and are spotted in an old ghosttown on mars! Your job as "Robot Hunter" is to destroy the pirate machines before they kill any more settlers! Exciting! Challenging! Full graphics!

Package Four — \$12.95

SUPER HORSERACE!

Make your bets just like at the real racetrack! 8 horses race in this spectacular graphic display! Up to 9 people can play! Use's real odds but has that element of chance you see in real life! Keeps track of everyone's winnings and losings. This is one of the few computer simulations that can actually get a room of people cheering!

MAZE MOUSE

The mouse with a mind! Computer generates random mazes of whatever size you specify then searches for way out! The second time thru he'll always go fastest route! A true display of artificial intelligence! Full graphics, mazes & mouse!

AMOEBIA KILLER

You command a one man submarine that has been shrunken to the size of bacteria in this exciting graphic adventure! Injected into the presidents bloodstream, your mission is to destroy the deadly amoeba infection rampaging his body!

LOGIC

This popular game is based on mastermind but utilizes tactics that make it more exciting and challenging! Has 2 levels of play to make it fun for everyone.

SUBMARINER

Shoot torpedoes at the enemy ships to get points. Fast action graphics, arcade type game is exciting and fun for everybody!

Package Five — \$12.95

20 HOME FINANCIAL PROGRAMS

Did you ever get a loan and wonder if they figured interest or payments correctly? Or did you ever want to see what your payments would be if you borrowed x amount at x% interest over x years! Figures amortization, annuities, depreciation rates, interest tables, earned interest on savings and much, much more. This program will get used again and again. A must for the conscientious, inflation minded person.

Package Six — \$12.95

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TRS-80 IS A REGISTERED TRADEMARK OF TANDY CORP.

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functions include exponent, logs, square roots, absolute values and random numbers as well as trig functions and logical operators. String operations feature comparisons of variables, concatenation, variable type conversion and substring separations.

A related feature of the Apple II Plus is the new Auto-Start control ROM, which automatically puts the machine into BASIC programming mode when the system is turned on. This feature eliminates preliminary commands,

grade of the original TRS-80. Rather, Radio Shack said, the Model II was designed to take up where the original left off. The machine can be used as a general purpose data processing computer, an intelligent terminal and a word processor. Radio Shack now offers disk-based software for general ledger, accounts receivable, inventory control, mailing list management and payroll, and plans more software for the future.

In addition to either 32K or 64K in-

ternal random access memory, Model II has one built-in 8" floppy disk that stores an additional one-half million bytes, including the Disk Operating System. The computer can be expanded to a four-disk system.

A built-in 12" high-resolution video monitor displays 24 lines of 80 normal characters or 40 expanded characters. It features upper and lower case letters. The 76-key detachable keyboard, with 10-key numeric keypad, includes functions such as Control, Escape, Caps, Hold and Repeat, and features two software-programmable Special Function keys.

An enhanced Level III version of the TRS-80's Level II BASIC language and TRSDOS operating system are automatically loaded in memory when the machine is turned on. In addition, each time the computer is powered up, it tests itself for proper operation.

Built-in input/output capabilities include two RS-232C channels and one Centronics parallel port. Future expansion is provided for through four plug-in slots for optional PC boards. According to Radio Shack, expansion boards are under development now.

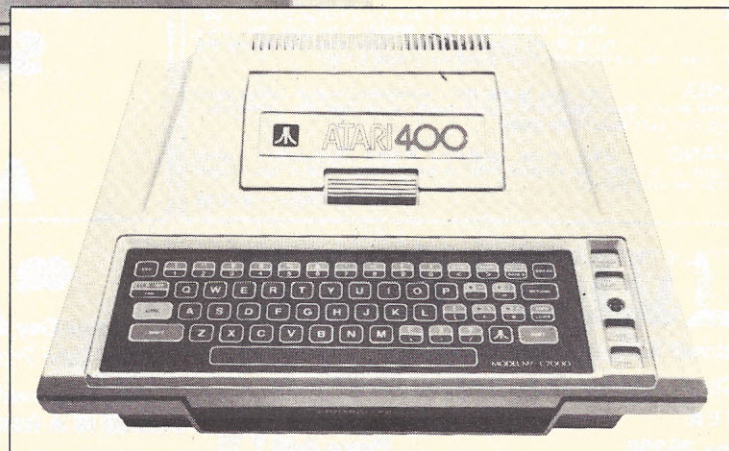
The computer sells for \$3450 in a 32K minimum configuration. A one-disk Model II with 64K RAM costs \$3899. Other configurations including printers and additional disks are also available.

Model II can be expanded to include up to four disk drives. A one-drive expansion system (giving you a total of two drives) costs \$1150; a two-drive system costs \$1750; and a three-driv

making the system easier for novices to use, Apple noted. On disk-based systems, the ROM will automatically load and run a user-specified program from disk — useful for business applications such as general ledger or inventory.

Price for an Apple II Plus system is the same as for an Apple II system of the same memory size. A 16K unit costs \$1195. A 32K system sells for \$1345, while a 48K goes for \$1495.

The TRS-80 Model II is not an up-



Atari's two systems retail for \$550 and \$1000.

system sells for \$2350.

Jade Computer Products offers a computer called the Piggy. Piggy is available in several configurations. The mainframe alone costs \$475. A minimum Disk System, including one disk, 24K Expandoram, keyboard, monitor and other features, costs \$2295. A Word Processing System, including 32K Expandoram, two disk drives and Electric Pencil software plus other features, costs \$2895; with Qume KSR Printer, the same configuration sells for \$5795. In addition, Jade offers numerous other computer products and software.

Disk Drives

If you're looking for a disk drive for your TRS-80, Percom Data Company has expanded its TFD line of add-on mini-disk systems to include a dual drive unit featuring double-density storage. Designated the TFD-1000, the unit provides 800K bytes of on-line storage. Two systems (four drives) may be used with a TRS-80 to provide 1.6M bytes on line.

TFD-1000 is supplied complete with an interconnecting cable (which accommodates either one or two units), a peripheral adapter module (PAM) PC card, Percom's MICRODOS operating system, and support documentation.

The PAM card replaced the RS-232-C card in the TRS-80 Expansion Interface and includes RS-232-C circuitry itself so that serial interfacing capability is retained.

MICRODOS operating system, which replaces TRSDOS, was developed especially for business and professional applications. It provides full random access capability, is fast and requires less than 7K of RAM, the company said. MICRODOS comes on a system diskette that includes BASIC program examples.

The TFD-1000 complete with cable, operating system, PAM card and documentation costs \$2495. Two TFD-1000 units (four drives) cost \$4950.

A 77-track TRS-80 mini disk drive from Microcomputer Technology called TF-7, features 77 tracks and an on-line storage capacity of 195K. To realize the full potential of the disk system, a new 77-track version of the MTI/Apparat DOS+ disk operating

system is being distributed.

MTI offers TRS-80 users a wide selection of single or dual head disk drives. All systems include the drive, power supply and enclosure. MTI's family of single-head drives permits you to select the drive of your choice from MPI, Pertec and Interfacing any of the drives is accomplished through the TRS-80 Expansion Interface, which can accommodate four single-head drives or two dual-head drives.

Model TF-7, 77-track disk drive unit is priced at \$625 while the other disk



ISC's X-Y controller for the Apple II costs \$39.95.

drives in the MTI family start at \$379. All units are available for immediate delivery.

Pedisk System 4 from CGRS Microtech is a full-size 8" floppy disk/memory expansion system for the Commodore Pet computer. Each eight-inch standard disk drive provides 250K bytes, totaling 1 megabyte of on-line mass storage when the system is expanded to a maximum of four drives. The Pedisk system includes a built-in memory expansion in the form of an S-100 bus adaptor and a 5-slot S-100 motherboard. The system comes with a software package to allow you to LOAD, RUN, SAVE, and UPDATE programs or data directly or under software control. PRINT, INPUT, OPEN and

CLOSE data files.

No modifications are required to the Pet to install the Pedisk System. Pedisk plugs into the Pet memory expansion connector. The System 4 with 5-slot S-100 motherboard and expansion chassis and a single 8" disk drive sells for \$1495. Additional disk drives are available for \$995. Several other mini-floppy based Pedisk systems are available starting at \$795.

Thinker Toys offers three S-100 compatible 8" full-sized floppy disk subsystems. Discus 2+2, a quad density floppy disk system stores up to 1.2 megabytes of data using the IBM compatible soft-sectored format and double-sided floppy disk drives.

Discus 2D is a double-density floppy disk

system with a capacity of 600K bytes, also using the soft sectoring IBM format and a single sided 8" floppy disk drive.

Disk Jockey 2D, an S-100 compatible controller used with both systems, includes a serial I/O port with a UART and programmable baud-rate generator. Also present in the controller is 1K of RAM and 1K of ROM programmed to execute basic disk functions such as read sector, write sector and bootstrap load. The controller contains "jump start" logic so that stand-alone systems can automatically bootstrap load on power-up.

Discus I is a single density system with a capacity of 250K bytes of storage again using the IBM soft sector

format. The Discus I system uses the Disk Jockey I single density S-100 compatible controller, which includes 1/2K of ROM with disk utility subroutines, 256 bytes of RAM and a software drive serial I/O port.

All systems come fully assembled and tested and will operate in S-100 systems running at 2MHz, 4 MHz or 5 MHz which meet the proposed IEEE standard for the S-100 bus.

The 8" disk drives are mounted in beige single or dual cabinets which include a self-contained power supply, detachable line cord and detachable 50-conductor signal cable.

Included in the price of each system is a disk operating system called Disk/ATE and an advanced BASIC language interpreter called BASIC-V which has virtual memory addressing capabilities. Optional software such as Digital Research CP/M, Microsoft BASIC or Microsoft Fortran is available at extra cost. All Discus systems are available through local computer stores.

Prices for the various units are: Discus 2+2, \$1545; Discus 2D, \$1149; Disk Jockey 2D, \$379 (kit), \$429 (assembled); Discus 1, \$995; Disk Jockey I, \$179 (kit), \$229 (assembled).

Printers

Radio Shack's TRS-80 Quick Printer II, which uses 2-3/8" wide aluminum coated paper, prints both upper and lower case characters, as well as double-size characters and double-spaced characters to allow for special effects such as titling pages or printing headings.

Automatic "wrap-around" prevents data loss due to overflow when the text exceeds the maximum line length. The printer is software selectable for 16 or 32 characters per line, and produces 120 lines per minute, 64 characters per second.

Character set is a modified subset of ASCII, 96 characters with upper and lower case, 5 x 7 dot matrix, 6 lines per inch vertical spacing. It can produce all 32 ASCII control codes in addition to codes for the printed characters.

Quick Printer II features three standard interfaces: TRS-80, RS-232C and 8-bit parallel. It can be connected directly to the TRS-80 CPU or, with optional cable, to the expansion interface. Price is \$219 from Radio Shack

Computer Centers, stores and dealers.

Two TRS-80 line printers, designed for business applications, will also work with most other computers having parallel I/O ports.

The TRS-80 Line Printer III provides 15-inch wide, 132 character lines and prints at 120 characters per second in 9 x 7 dot matrix upper and lower case letters. The bi-directional printing head prints in both directions as it moves across the paper.

Accurate positioning of preprinted forms such as invoices or checks is simplified with controls for line-feed in increments as small as 1/8th line. Expanded (wide) characters are software selectable for headings or emphasis in printed reports.

The adjustable tractor mechanism feeds continuous forms of varying width up to 15 inches and assures accurate alignment of multi-page printouts and single up to five-part forms. Drive motors run only during actual printing.

Another feature of the Line Printer III is its self-test function. Built-in microprocessor circuitry controls the printer. Basic operating instructions and self-test routines are in ROM.

The TRS-80 Line Printer II also produces expanded as well as upper and lower case letters using a 7 x 7 dot matrix format. Speed is 50 characters per second on 8-inch lines of 80 characters each.

The unit operates in both friction-feed and pin-feed modes and can handle continuous roll paper, single sheets and continuous forms up to 9 1/2 inches wide with an original and up to two copies. Forms are kept in alignment by non-adjustable pins built onto the platen.

When used as a friction-feed unit, inexpensive roll paper fits on a detachable rear bail. The pin-feed mechanism accepts standard computer-grade fan-fold paper.

TRS-80 line printers are available from Radio Shack stores, computer centers and dealers. Line Printer III is priced at \$1999; Line Printer II is \$999. Prices include connecting cables.

Selectra-Print is an IBM Selectric II typewriter modified for computer output by Micro Computer Devices. You just plug the typewriter into almost any computer to produce high-quality print-

outs. The unit operates at 15 characters per second, and all the IBM typing elements are available. The modified typewriter can still function as a standard typewriter (though *not* as an input device). Options include dual pitch, correction feature, noise reduction feature, RS-232 interface and pin or tractor feed. Selectra-Print costs \$1850 (TRS-80 version, \$1925) from Micro Computer Devices.

Odds and Ends

Apple's Graphics Tablet, attached to any Apple computer, gives educators, businesspeople, artists and scientists a powerful graphics tool for tasks ranging from digitizing circuit board schematics to creating high-resolution, multicolored original art. The compact, portable tablet is a versatile data entry tool which takes advantage of Apple's high-resolution color, yet is simple to operate. It provides two key features: the tablet, once installed, is ready to use with a standard software package (written in BASIC) whenever you turn on the computer; and it can be customized by the user with special symbols and functions.

The Graphics Tablet features an 11 x 11 inch drawing surface, a coated mylar overlay (containing the menu of tablet functions), a stylus (drawing pen), disk-based software and a printed circuit interface card which plugs into the Apple computer. Applications include freehand drawing, creating original art, digitizing and modifying detailed drawings, tracing, and producing color separations.

Hardware requirements for the tablet include an Apple II or Apple II Plus computer with Applesoft BASIC and 48K bytes of RAM memory, an Apple II floppy disk drive and a television set or video monitor. You may also connect a printer to the computer to obtain hard copies of your graphics work. Retail price is \$795 at any Apple dealership.

From Computer Plus, Inc., the Videostick X-Y controller for the Apple II features a large push (firing) button and a high quality, long life linear joystick designed for video applications such as plotting graphics or playing games. The controller plugs directly into the Apple II and can be hand held or table positioned. Price is

\$39.95. The company plans models for the Pet, TRS-80 and CompuColor.

West Side Electronics sells two boards useful for Apple II owners. The Appletime Real Time Clock plugs into any slot on the Apple II motherboard. It provides continuous time-of-day information to the computer. This information can be used in machine language, BASIC or Applesoft programs. Applications include displaying time on the screen or printed output, data logging, controlling other devices according to time and stopwatch functions. The Appletrottle board lets you use the game paddles to vary the speed at which the computer operates. Thus, you can slow down or even stop a program listing, trace or run. Appletime costs \$79.95 and Appletrottle costs \$89.95.

Interactive Structures offers analog input and output cards for the Apple II. The AI-02 Analog Input Card provides a single card data acquisition system. Sixteen analog channels may be monitored by the system with 8-bit resolution. Channels are individually addressable and conversion time is 70 micro seconds. The system can be operated easily from BASIC, and also provides interrupt capability for efficient software implementation. The AI-02 is suited to a variety of applications including temperature sensing and process control.

The AO-03 is a latched analog output card available in 2-, 4-, and 8-channel configurations. A program written in any language can set the output of a channel with a single operation. The AO-03 accepts an 8-bit quantity (0 to 255) and produces either a 0 to 10 volt output (standard) or a -5 to +5 volt range (jumper selectable). The unit, together with the AI-02 analog input system, represents a complete control and measurement facility for the Apple II suited for home sensing and control, laboratory experiment control or industrial process control. Literature on both products is available from Interactive Structures.

Your TRS-80 computer can actually talk back to you in electronically generated speech using the voice synthesizer introduced by Radio Shack.

The synthesizer, which translates the computer's output into recognizable, intelligible speech, includes a volume

control, built-in speaker and cable assembly that permits easy plug-in connection to TRS-80 systems.

Programming for speech is done in BASIC; about 60 phonemes, representing units of speech, can be entered via the keyboard.

According to Radio Shack, the computer can even speak in foreign languages or with an accent by integrating the various phonemes to produce the desired sounds.

The voice synthesizer can be used in education to supplement the displayed video information in a variety of learning situations, such as spelling, reading, language arts and mathematics.

Price is \$399, including detailed instruction manual and demonstration cassette. You can buy the unit at Radio Shack stores and dealers.

One colorful gift for TRS-80 owners is a set of August Automation's fabric dust covers. A 3-piece set (\$19.95) fits systems without an expansion interface. For systems with expansion inter-

face, the company offers a long 3-piece set (\$22.95), which includes a video dust cover long enough to shield the expansion interface as well. The long video cover alone costs \$11.95. A keyboard cover alone costs \$7.95. A disk drive cover costs \$7.95; and a screen printer cover costs \$9.95. The covers are available in black, mint green, royal blue, cream, peach, rust brown, grey and red velour; brown, royal blue, navy and cream corduroy; and blue denim.

For the person who has almost everything, 3G Company, Inc., offers a remotely controlled model van for the TRS-80. A fully interfaced command unit plugs directly into the output port of the TRS-80 and operates the van by radio transmission.

Use of the robot van is limited only by your ingenuity: run one program and the van delivers a message to someone else; enter another command and the small vehicle runs through a complicated maze.

For serious applications, the van can



3G model van, controlled from TRS-80 keyboard, is priced at \$85.

be used to experiment with real-time programming. Programs using simple BASIC statements can be written to execute various time and space dependent maneuvers. Programs can range from simple commands to complex maneuvers.

The command module uses a single port address and does not preclude use of the remaining ports for other purposes. It is programmed through BASIC statements to control forward, reverse, right, left, start and stop. The robot vehicle can also be operated manually by the steering wheel and manual switches. The headlights are operational.

The robot command van is completely assembled and ready to plug into a TRS-80. Demonstration program and instructions are included. The van is sold mail order with a 30-day, money back guarantee. The package sells for \$85 plus \$3 postage and handling.

Interact directly with the information displayed on your Pet or TRS-80 video display with a self-contained light pen from the 3G Company, Inc.

The light pen enables you to select from a menu on the display and interaction makes it easy for a non-computer oriented person to use your programs. Other applications allow children who do not know how to type to bypass the keyboard and interact directly with the display.

The light pen is completely assembled and ready to plug into your Pet or TRS-80. A sample program and instructions are included.

The pen is sold through mail order. The Pet version sells for \$29.95 plus \$1.50 for handling and postage; the TRS-80 version is priced at \$34.95 plus postage and handling.

You can add memory to your Pet computer with Eventide Clockworks' Big Mem, which comes in 16, 24 and 32 kilobyte configurations. Big Mem is complete with all necessary hardware, and requires no electrical modification to the Pet. The 24K version (\$525) permits writing programs to the total capacity of the Pet. The 32K version (\$615) lets you store protected machine language programs and displays. The 16K version costs \$420.

Honders, Inc., offers a complete home or office AC remote control system for the Commodore Pet or CBM.

Virtually any electrical device can be switched on or off and lamps can be dimmed or brightened under computer control. No additional wiring is needed. The computer sends signals through the house wiring for distribution. Up to 256 points can be controlled.

The basic package (\$179) includes a plug-in module to Commodore's second cassette port, three remote power controllers and a cassette software package for demonstration and applications. Additional remotes for lamps or appliances are available for \$16.95 each.

Percom Data Company's SS-50 bus product line includes a video display board for 6800 microcomputers. Called the Electric Window, the device is memory-resistant, programmable and displays up to 24 80-character lines. A driver program is also available.

The company said the board's generated display is like a window through which the operator can observe the memory space where characters are being input and manipulated. This feature is convenient in all applications, but has exceptional value in text and word processing where the effects of editing and line justification are instantly visible.

Other features of the Electric Window include: two character generators, one for standard characters and one that can be programmed for special characters; dual-intensity lighting, high-lighting display; display scrolling; descenders on lower case letters; and programmable display positioning.

The Electric Window, compatible with standard video monitors, comes with an instruction manual.

Windex, an Electric Window driver program, accomplishes cursor movement and display scrolling through a control chip on the Electric Window card. This hardware control feature, according to Percom, provides for fast program execution. Two versions of Windex are available, one for 6800 applications and one for 6809 applications.

The Electric Window sells for \$249.95. Source and object programs of Windex are available on LFD-400 compatible diskette for \$29.95 and on ROM for \$39.95.

Microdesk from Computer Systems

Design allows the keyboard and video display to be placed at a convenient typing height. The computer may be placed on the adjustable shelf or on the top of the Microdesk. A fixed shelf may be used for additional equipment or books. The unit's open back allows ventilation and passage of cables. Microdesk can be assembled in a few minutes without tools. The desk, constructed of high density particle board covered with a hard plastic walnut-grained laminate, measures 48" L x 24" W x 26" H and the shelves are 23" x 23". The price of \$199 includes shipping within the U.S. (except to Hawaii and Alaska).

Wordsmith Video Subsystem by Micro Diversions is an intelligent editing terminal/word processor for North Star Horizon and most other S-100 computers. The fully integrated system provides a 72-key Selectric-type keyboard with 19 special function keys; a 15" high resolution monitor, the Screensplitter 40-line by 86-character memory-mapped video display board with programmable character generator and on-board subscreen management software, and the Wordsmith page-oriented document processor. Wordsmith maintains standard CP/M file structure as well as compatibility with most other disk operating systems. Price is \$1395.

Electronic Specialists offers a line of Isolator filtered 3-prong AC sockets with surge suppression. The units protect computers and peripherals by isolating your equipment from line hash and power line surges. The Isolator line includes a number of units to meet a variety of needs. Prices range from \$54.95 to \$119.95.

Books

One of the handiest books you can give a computerist is *The BASIC Handbook* by Dr. David A. Lien. This reference manual lists commands, statements, functions and operators from over 50 dialects of BASIC. Each listing includes the word or abbreviation; the definition, telling what the word does and, often, which computers it works on; a test program to see if your computer accepts the word; hints on programming techniques using the word; notes on variations in usage; and cross-references to related words. But best of

all, Lien tells you how to program around the word (if your computer doesn't have it) and still achieve the same result. This feature is especially handy for translating published programs into your particular machine's dialect. The book, from Compusoft Publishing, is a bargain at \$14.95 plus \$1.35 postage and handling.

Two other Compusoft books written by Lien (author of Radio Shack's popular Level I Users/Learners Manual) are of particular interest to TRS-80 owners. The first, *Learning Level II*, a sequel to the Level I Manual, is written in the same easy-to-read style. Price is \$15.95 + \$1.45 postage and handling. The second carries the intriguing title *Controlling The World With Your TRS-80*. The book teaches how to write control programs in BASIC. No computer modifications are required. Dr. Lien said, "*Controlling The World* was written for science fair students of all ages. You don't have to be an engineer to understand it and put your computer to work". Price is \$19.95 + \$1.50 postage and handling.

Computer Games for Businesses, Schools and Homes, by J. Victor Nahigian and William S. Hodges, offers 27 original computer games. Each game, written in 8K BASIC, includes helpful programming notes. Complete printouts are listed for each game. Titles include Biorhythm, Boggle, Bullet, Compat, Date, Dogs, Easter, Escape, Fish, Jackpot, Notone, Poem, Psycho, Tablab and Star Trek. The \$10.95 book is published by Winthrop Publishers.

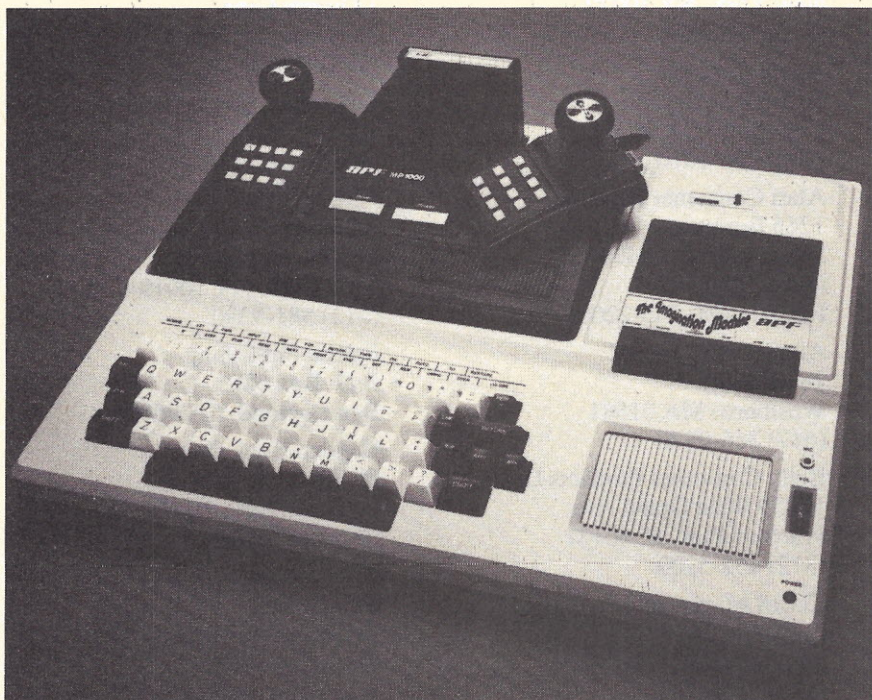
TRS-80 Software Source from Computermat is a directory listing over 5000 programs available for Radio Shack computers. Each listing includes title of the program, a brief description, level, price, media, class (business, game, etc.) and vendor. Categories include business, education, games, home, math and utility programs. A listing of vendors, addresses and phone numbers is also included. The book is updated periodically. A single copy costs \$6.

Paul Belais' *Master Index to Computer Programs in BASIC* lists over 500 programs from ten home computer magazines, including *Personal Computing*. The programs are indexed by categories: business, finance, games, math, personal interest, science/educa-

tion and utility. Subjects are further broken down within each category. Each entry includes title and author with complete reference to the source, a paragraph of description, number of program lines, BASIC version used, and any special hardware or software requirements. This handy index costs \$9.95 from Falcon Publishing.

For the budding entrepreneur, consider a copy of Don Lancaster's *The Incredible Secret Money Machine*.

2). Features of the programs include interactive data entry; error correction; monthly, quarterly and yearly cumulative totals for each employee; summaries of the current year's paychecks for each employee; job costing; flexible deduction schedule for every employee; check printing; and various reports. The book costs \$15. Other books in the CBASIC series include *Accounts Payable and Accounts Receivable* and *General Ledger*.



The Imagination Machine, a multi-purpose entertainment center sells for \$500.

This delightful paperback tells you how to turn your computer or craft hobby into your own small business. With lucid writing and offbeat humor, Lancaster gives practical advice on making your new business grow. The book costs \$5.95 from Howard W. Sams & Co.

Also in the business book field, Creative Computer Consultants publishes *General Ledger*, a book of accounting programs for small computers. The programs require a BASIC system with disk file capability and a hard copy device for producing reports. At least 16K RAM is recommended. Price for the book is \$19.95.

Payroll With Cost Accounting — CBASIC, from Osborne/McGraw-Hill, offers listings and documentation of programs written in CBASIC (Version

Hayden Book Company's 1980 Computer Calender features 14 full color original computer works of art (much of the art is generated through one of the main computers at MIT); a complete program in BASIC for a perpetual calender; and computer and computer-related anecdotes. Retail price is \$5.95.

Personal Computing magazine offers two gift ideas you should definitely not overlook. *The Best of Personal Computing*, compiled from the magazine's first two years, contains over 20 practical business and home applications programs, including the popular Check Register Accounting System, a computerized bartender, investment analysis program and vacation planning software. A special feature in the book examines the questions you

should ask manufacturers, retailers and yourself before purchasing a small business computer.

For a gift that gives all year long,

sign your friends up for *Personal Computing* subscriptions. Each monthly issue contains practical, ready-to-run programs. In addition, tutorial articles

show how to write your own programs, and monthly departments keep you up to date on new products, computer chess and bridge, and news and happenings in the microcomputing world. One year (12 issues) costs \$14; two years costs \$26; and three years, \$38. □

Buyer's Guide Vendors

APF Electronics, Inc.
444 Madison Ave.
New York, NY 10022
(212) 758-7550

Apple Computer
10260 Bandley Dr.
Cupertino, CA 95051
(408) 996-1010

Atari Consumer Division
1265 Borregas
Sunnyvale, CA 94086
(800) 538-8547
In CA: (408) 745-2200

August Automation
28 Milk St.
Westboro, MA 01581
(617) 366-0870

Bally Consumer Products Div.
10750 West Grand Ave.
Franklin Park, IL 60131
(312) 452-5200

CGRS Microtech
P.O. Box 368
Southampton, PA 18966
(215) 757-0284

Compusoft Publishing
8643 Navajo Rd.
San Diego, CA 92119
(714) 465-3322

Computermat
Box 1664
Lake Havasu, AZ 86403
(605) 855-3357

Computer Plus
1324 South Mary
Sunnyvale, CA 94087

Computer Systems Design
906 N. Main
Wichita, KS 67214
(316) 265-1120

Creative Computer Consultants
P.O. Box 211
1 Quarry Lane
Norwalk, CT 06851
(203) 847-0141

Electronic Specialists
171 So. Main St.
Natick, MA 01760
(617) 655-1532

Eventide Clockworks
265 W. 54th St.
New York, NY 10019
(212) 581-9290

Falcon Publishing
P.O. Box 688
Ben Lomond, CA 95005

Hayden Book Co.
50 Essex St.
Rochelle Park, NJ 07662
(201) 843-0550

Honders, Inc.
Kennel Rd.
Cuddebackville, NY 12729
(914) 754-7106

Howard W. Sams & Co.
4300 W. 62nd St.
Indianapolis, IN 46268

Interact Electronics, Inc.
P.O. Box 8140
Ann Arbor, MI 48107
(313) 973-0120

Interactive Structures, Inc.
Suite 204, Science Center
3401 Market St.
Philadelphia, PA 19104
(215) 382-8296

Jade Computer Products
4901 W. Rosecrans
Hawthorne, CA 90250
(213) 679-3313

Micro Computer Devices
3156 E. La Palma Ave.
Suite H
Anaheim, CA 92806
(714) 630-8206

Microcomputer Technology, Inc.
2080 S. Grand Ave.
Santa Ana, CA 92705
(714) 979-9923

Micro Diversions
8455-D Tyco Rd.
Vienna, VA 22180
(703) 827-0888

Osborne/McGraw-Hill, Inc.
630 Bancroft Way
Berkeley, CA 94710
(415) 548-2805

Percom Data Co.
211 N. Kirby
Garland, TX 75042
(214) 272-3421

For orders:
(800) 527-1592

Personal Computing
1050 Commonwealth Ave.
Boston, MA 02215
(617) 232-5470

Radio Shack
1300 One Tandy Center
Fort Worth, TX 76102
(817) 390-3272

Thinker Toys
5221 Central Ave.
Richmond, CA 94804
(415) 524-2101

3G Company, Inc.
Rt. 3, Box 28A
Gaston, OR 97119
(503) 662-4492

West Side Electronics
P.O. Box 636
Chatsworth, CA 91311

Winthrop Publishers
17 Dunster St.
Cambridge, MA 02138
(617) 868-1750

Breaking Even

Production Level Analysis

— BY KAREN S. WOLFE —

We sold 45 tons of zippers last month! Why are we still losing our shirts (or worse) in this business?" Sounds like a job for Break-Even and Production Level Analysis.

The following program not only calculates your break-even production level but also your total cost, total revenue and profit/loss at various production levels. As a bonus, it even graphs that old textbook favorite, the Break-Even Chart (although in a slightly tilted fashion).

Do not let the idea of "production levels" scare you off because your business is not a manufacturing concern. Actually, I could have substituted the words "sales levels" or "service levels" or even "activity levels" for the production terminology.

Before initiating this program, you should already know your fixed costs for whatever time period you're studying. Fixed costs, which do not change as the production level changes, include rents, leases, depreciation, telephone, insurance, certain salaries and payroll taxes on those salaries.

Look through your expense records and determine which expenses you would still have to pay even if you produced nothing, sold nothing or serviced nothing. Those will be the fixed costs.

You must also know your average variable cost per unit of production. This figure can include raw materials, labor, certain types of insurance or energy (electric, gas or gasoline) — all those costs that change as the level of production changes. You may find it difficult to decide if some expenses are really fixed or variable, for example, certain insurances and some salaries or wages. Well, you simply must make a

decision. Allocate the costs as best you can; no one knows your business better than yourself.

Actually, there's a short cut for determining the total variable cost: subtract the fixed cost from the total costs in your accounting records. The result is the total variable cost (TVC).

But, you need the average variable cost per unit for the program, or the AVC. Simply divide the TVC by the number of units produced during the time period in question. It would be a good idea to sample several months of data to arrive at a proper AVC. The following exercise gives you an example.

	TVC	Prod.	Level AVC
June	\$500	50 units	\$10.00
July	550	53 "	10.38
Aug	560	53 "	10.57

The monthly average AVC for those three months is, therefore, \$10.32, which would be used in this computer program.

Break-even analysis is best suited to a single product or service. If you are manufacturing, selling or servicing several different products, then the cost associated with each individual product must be separated from total costs and an analysis done for each of those products.

Sample Run: Pinning Down Paper Clips

Suppose we have the following monthly information for a paper clip manufacturer: fixed cost = \$200; average variable cost per ton = \$10; and sales price per ton = \$14.

The program prompts you for the

inputs and those entries are underlined in the sample run. The computer will respond with "BREAK-EVEN LEVEL OF PRODUCTION IS (so many) UNITS".

But you really need to know more than just the break-even point. You should have a good idea of the profit (or loss) potential for various levels of production. The program will calculate and display a table of variables for production levels that you request.

First, you are prompted to enter the number of production level calculations you want to request. In the sample run, we ask for "4". The program begins a loop that will ask you to input each production level to calculate the profit or loss on. We used 40, 100, 150 and 200 in the sample.

Now you have an option for either screen display on the monitor or hard-copy on a printer. The output will be the same for either; only the communication medium changes depending on your response to the prompt.

Descriptive information is reproduced first, followed by the break-even point and finally, the table showing the fixed, variable and total costs, the total revenue and the profit or loss at the different production levels.

The table is followed by another set of prompts which will appear on the monitor even if you had the output delivered by a printer. These prompts are to set up the guidelines for the Break-Even Chart. Some care must be taken when deciding the dollar and unit hash mark increments. If you thoughtlessly input the upper dollar limit and the increments, chances are that the chart will

appear to be a little thoughtless, too. Of course, you'll have the option of having the chart displayed on the screen or in hardcopy form.

You are asked to enter the upper limit, dollar amount for the chart and it must be divisible by 50. (The chart is designed to fit within 60 total spaces; 10 for unit amounts and 50 for the actual graph.) By looking at the total revenue figures in the table, you should be able to judge an appropriate dollar limit for the chart. In the sample, 200 units of production resulted in \$2800 of total revenue. I decided the chart should go beyond 200 units and \$2800, so I entered 5000 for the upper limit. Next, you're prompted to enter the hash mark increment for the dollar axis. Help the program by entering an increment that will divide evenly into the upper limit. (I take no responsibility for the program if you don't follow this suggestion!)

Next, enter the increment for the unit axis. Don't make this increment *too* small or else your chart may run slightly longer than necessity dictates. From looking at the numbers in the table, I decided that 20 would supply a sufficient number of points to make a good looking chart without becoming excessive.

The resulting break-even chart does not match the textbook version exactly since the dollars are on the horizontal axis across the top while the units of production are on the vertical axis along the side. (The textbook version has dollars on the vertical axis and units on the horizontal.) The reason for this switch is one of desperation. If you don't have graphics capabilities with your computer system, then about all you can use to do any plotting is the TAB function, which lets you plot a point on the horizontal plane. Since this program is calculating and plotting the dollars per given production units using the TAB function, then the dollars had to be on the horizontal axis.

I believe it is possible to do the chart in the textbook fashion with a little ingenuity; but I depleted my ingenuity just creating this tilted excuse for a break-even graph.

Program Listing

The program is written in North Star BASIC and “\” separates multiple line statements. The “!” symbol means PRINT. If your system is not North Star BASIC, just substitute PRINT for “!” and your system's multiple line division symbol for “\”.

Sample Run

ENTER COMPANY NAME XYZ CORP

ENTER CODE FOR THIS RUN PAPER CLIPS

ENTER TIME PERIOD (MONTH, QUARTER, YEAR) MONTH

ENTER FIXED COST FOR PERIOD 200

ENTER AVERAGE VARIABLE COST PER PRODUCTION UNIT 10

ENTER UNIT SALES PRICE 14

BREAK-EVEN LEVEL OF PRODUCTION IS 50 UNITS

ENTER NO. OF PRODUCTION LEVELS TO RUN 4

ENTER A PRODUCTION LEVEL 40

ENTER A PRODUCTION LEVEL 100

ENTER A PRODUCTION LEVEL 150

ENTER A PRODUCTION LEVEL 200

DO YOU WANT HARDCOPY (Y/N)? Y

If you don't have a printer, then delete lines 1750, 1800, 1900, 1950, 2000, 2700, 3500, 3550, 3560, 3570, 5590 and 5600. If you do have a printer you must change lines 2000 and 3570 so that they will select your printer using your system's codes. Lines 2700 and 5600 must also be changed to your codes to select the screen monitor when returning from the printer. REM statements in the program remind you that these changes are required.

Also, if you don't have North Star BASIC, line 2500 may look like Darth Vader's helmet size. Actually, it is the formatting and printing statement for the table of production level calculations.

The “%” symbol is a format signal. It is probably not necessary in your system's BASIC, but you will want to format the table's printout. So, I'll at-

tempt to explain the dimensions used in this statement so you can change the codes to match your system's requirements.

First, “!%7I” means PRINT the following variable-Q(N)-in a format of 7 integer spaces. Next, variable F is printed in an 11-space integer field. Variable V(N) is printed in an 11-space field with 2 spaces to the right of the decimal point, as is variable C(N). Variables R(N) and P(N) are printed in 12- and 10-space fields respectively, also with 2 spaces to the right of the decimal point. Obviously, if your calculations result in values larger than can be printed in these dimensioned fields, then the program will not be able to print them and will stop with an error code displayed on the screen (or printer).

I've tried to design the printouts to fit

Sample Printout

COMPANY NAME: XYZ CORP
NAME OF RUN: PAPER CLIPS
PERIOD: MONTH
FIXED COST: 200
VARIABLE COST PER UNIT: 10
UNIT SALES PRICE: 14

BREAK-EVEN LEVEL OF PRODUCTION IS 50 UNITS

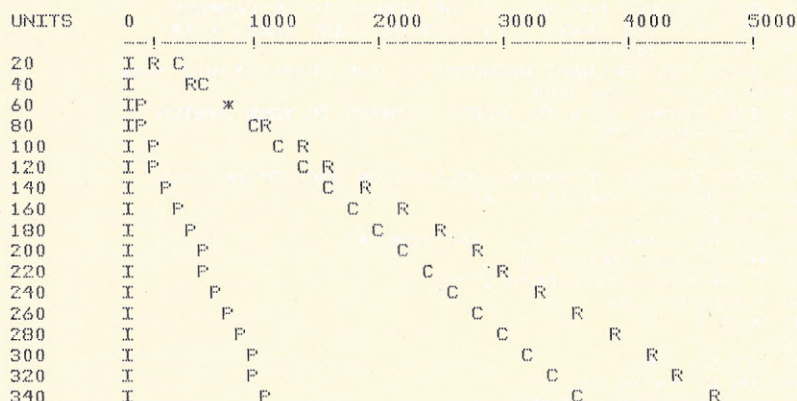
UNITS OF PRODUCTION	FIXED COST	VARIABLE COST	TOTAL COST	TOTAL REV.	PROFIT/LOSS
40	200	400.00	600.00	560.00	-40.00
100	200	1000.00	1200.00	1400.00	200.00
150	200	1500.00	1700.00	2100.00	400.00
200	200	2000.00	2200.00	2800.00	600.00

DO YOU WANT A GRAPHIC DISPLAY (Y/N)? Y

ENTER UPPER DOLLAR HASH MARK LIMIT
MUST BE DIVISIBLE BY 50 EVENLY 5000

ENTER \$ INCREMENT FOR HASH MARKS 1000

ENTER UNIT INCREMENT FOR HASH MARKS 20
DO YOU WANT HARDCOPY OF THE GRAPH (Y/N)? Y



Program Listing

READY
LIST 1

```

100 DIM Q(30),V(30),C(30),R(30),P(30),N$(30),T$(30),D$(1),P$(8)
200 !!!!!!!
300 ! " BREAK-EVEN AND PRODUCTION LEVEL ANALYSIS"!!!!!!
400 INPUT "ENTER COMPANY NAME ",N$ !
500 INPUT "ENTER CODE FOR THIS RUN ",T$ !
600 INPUT "ENTER TIME PERIOD (MONTH, QUARTER, YEAR) ",P$ !
700 INPUT "ENTER FIXED COST FOR PERIOD ",F$ !
800 INPUT "ENTER AVERAGE VARIABLE COST PER PRODUCTION UNIT ",A$ !
900 INPUT "ENTER UNIT SALES PRICE ",R$!!!!!!
950 REM CALCULATE BREAK-EVEN POINT (B)
1000 LET B=INT(F/(R-A))
1100 ! " BREAK-EVEN LEVEL OF PRODUCTION IS "B," UNITS"!!!!!!
1150 REM SET UP PRODUCTION LEVEL CALCULATIONS TABLE
1200 INPUT "ENTER NO. OF PRODUCTION LEVELS TO RUN ",I!!!!!!
1300 FOR N=1 TO I
1400 INPUT "ENTER A PRODUCTION LEVEL ",Q(N)!!!!!!

```

Continued on next page

within 64 spaces for screen display. If your dollar amounts, however, are very large, then these dimensions won't work. You should change the formatting or work in hundreds or thousands to make the numbers fit. (Remember, though, that if you enter fixed costs in hundreds then you must also divide the average variable cost and the sales price by 100 before entering, otherwise you'll be mixing apples and oranges. The units of production, however, will not be in hundreds; they are actuals.)

I believe the chart is understandable: C = total costs; R = total revenues; and P = profits. Notice that P does not appear in the chart until a break-even level is past, since you're running a loss until that point.

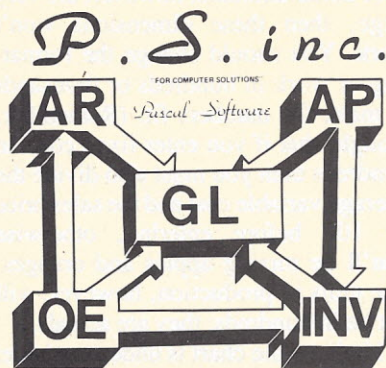
The chart is *not* totally exact, I'll be the first to admit. The reason is that the TAB function works with *whole* spaces. It cannot move 2.7 spaces and print a "P". It will round the calculated spaces to the nearest whole so that this "P" would be printed in TAB(3), not TAB(2.7). This limitation explains why we do not get perfectly linear printouts of C, R or P.

The "!" that appears in the horizontal axis without a number above it represents the fixed cost hash mark.

A word of warning: lines 3761, 3762 and 3763 all have the "!" symbol with quotation marks around it. This is *not* to be confused with the PRINT statement. We are using the "!" symbol for a hash mark and want to have it reprinted in the horizontal line. Now, the "!" that appears in lines 3761, 3762 and 3763 without the quotation marks (the very first "!") does stand for PRINT. Therefore line 3763 is: 3763 PRINT TAB(U1), "!". Just trying to keep you awake with all the "!!!!!!".

This program can be very valuable if used properly: that means pulling the proper fixed and variable costs out of your accounting sheets. If you feed in faulty data you'll get junk results—and no one wants to make decisions based on trash.

But, if you've got a good handle on your costs, then this program should be useful to you. One last word of warning: break-even analysis is based on the assumption of linear cost relationships. In other words, if the average variable cost is 10 dollars at a production level of 100, it will still be 10 dollars per unit at a level of 100,000. In actuality, that really doesn't seem possible. But within a reasonable range of production levels, that assumption is plausible and it makes the basic break-even analysis procedure possible. □



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CIRCLE 21

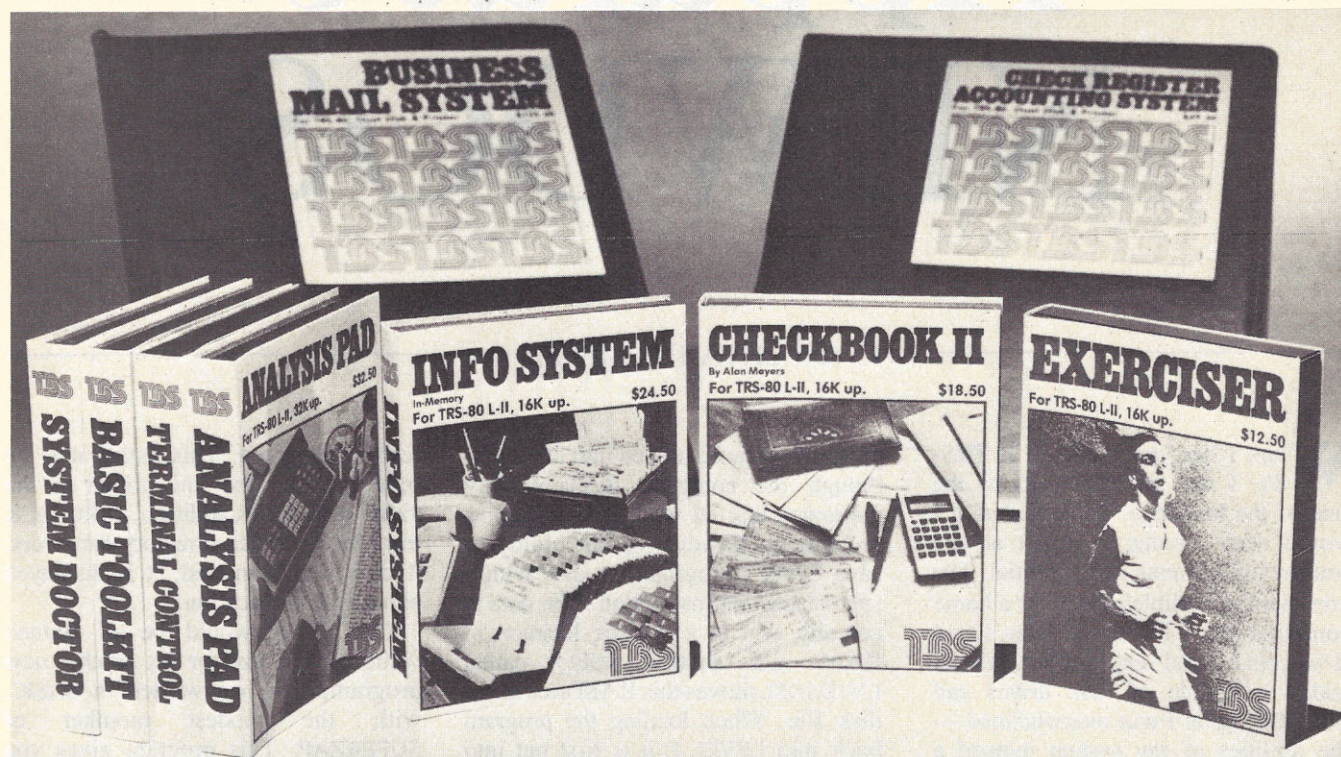
Program Listing continued

```

1500 LET V(N)=A*Q(N)\ LET C(N)=F+V(N)\ LET R(N)=R*Q(N)
1600 LET P(N)=R(N)-C(N)
1700 NEXT N
1750 REM\ IF YOU'LL NEVER WANT HARDCOPY, SKIP LINES 1800,1900,2000
1800 INPUT "DO YOU WANT HARDCOPY (Y/N)? ";D$!\!
1900 IF D$="N" THEN 2050
1950 REM\ CHANGE LINE 2000 TO YOUR SYSTEM'S CODE TO SELECT PRINTER
2000 FILL 10510,195
2050 ! "COMPANY NAME: ";N$!\ "NAME OF RUN: ";T$!\ "PERIOD: ";P$
2055 ! "FIXED COST: ";F \ ! "VARIABLE COST PER UNIT: ";A
2056 ! "UNIT SALES PRICE: ";R
2060 !\!\!
2070 ! " BREAK-EVEN LEVEL OF PRODUCTION IS ";B," UNITS"\!\!
2100 ! " UNITS OF FIXED VARIABLE TOTAL TOTAL PROFIT/"
2200 ! "PRODUCTION COST COST REV. LOSS"
2300 !
2350 REM\ LINE 2500 FORMATS AND PRINTS THE VARIABLES
2351 REM\ "%" IS A FORMATING SYMBOL IN NORTH STAR BASIC
2352 REM\ IF YOU DON'T USE NS BASIC, YOU WILL HAVE TO
2353 REM\ FORMAT THIS LINE WITH YOUR SYSTEM'S SYMBOLS
2354 REM\ IT PRINTS VARIABLES--Q(N),F,V(N),C(N),R(N) & P(N)
2400 FOR N = 1 TO I
2500 !%7I,Q(N),%11I,F,%11F2,V(N),%11F2,C(N),%12F2,R(N),%10F2,P(N)
2600 NEXT N
2650 REM\ LINE 2700 SELECTS THE MONITOR--CHANGE TO YOUR
2651 REM\ CODES IF NECESSARY
2700 FILL 10510,202
2800 !\!\!\!
2900 INPUT "DO YOU WANT A GRAPHIC DISPLAY (Y/N)? ";D$
3000 IF D$="N" THEN 9999
3100 !\ ! "ENTER UPPER DOLLAR HASH MARK LIMIT"
3110 INPUT " MUST BE DIVISIBLE BY 50 EVENLY ";U
3120 LET I = U/50\ LET D2 = INT(U/50)\ LET D3 = I-D2
3130 IF D3 = 0 THEN 3200\ GOTO 3100
3200 !\INPUT "ENTER $ INCREMENT FOR HASH MARKS ";H
3270 !\ INPUT "ENTER UNIT INCREMENT FOR HASH MARKS ";H1
3280 LET I = 50/U
3290 REM\ CONVERT DOLLARS TO TAB SPACES TO BE GRAPHED
3300 LET F1 = INT (F*I) + 10\ LET U1 = INT (U*I) + 10
3320 LET D1 = INT(U/H)
3500 INPUT "DO YOU WANT HARDCOPY OF THE GRAPH (Y/N)? ";D$
3550 IF D$="N" THEN 3600
3560 REM\ CHANGE 3570 TO SELECT PRINTER IN YOUR SYSTEM
3570 FILL 10510,195
3600 !\!\!\!
3670 REM\ SETTING UP GRAPH--DOLLARS ON HORIZONTAL AXIS
3680 ! " UNITS", TAB(10), "0",
3685 FOR N = 1 TO D1
3690 LET D2 = N*H\ LET D3 = INT((N*H)*I) + 9
3700 IF D3 >=U1 THEN 3730
3710 ! TAB(D3), D2, \ GOTO 3745
3730 ! TAB(U1), U,
3745 NEXT N
3746 !
3747 LET H2 = H
3750 FOR N= 10 TO 60
3751 LET D3 = INT (H2*I) + 10
3752 IF N = D3 THEN 3762
3756 IF N = F1 THEN 3761\ IF N = U1 THEN 3763
3760 ! TAB (N), "-";\ GOTO 3770
3761 ! TAB(F1), "!"\ GOTO 3770
3762 ! TAB(N), "!"\ LET H2 = H2 + H\ GOTO 3770
3763 ! TAB(U1), "!"
3770 NEXT N
3775 !
3790 REM\ CALCULATING AND PLOTTING BREAK-EVEN CHART
3800 LET Q4 = INT(U/R)\ LET Q5 = INT (Q4 / H1)
3880 FOR N = 1 TO Q5
3900 LET C = F + (A*(H1*N))\ LET C1 = INT(C*I) + 10
3920 LET R4 = R* (H1*N) \ LET R1 = INT (R4*I) + 10
3940 LET P = R4 - C\ LET P1 = INT (P*I) + 10
3945 LET D1 = INT(U/H)
3950 ! N*H1, TAB(10), "I",
4000 IF P1 < 10 THEN 5000
4100 IF P1 < C1 THEN 4200
4200 IF C1< R1 THEN 4250\ IF C1 = R1 THEN 4255
4250 ! TAB(P1), "P", TAB(C1), "C", TAB(R1), "R"\ GOTO 5500
4255 ! TAB(P1), "P", TAB(C1), "*" \ GOTO 5500
5000 ! TAB(R1), "R", TAB(C1), "C"
5500 NEXT N
5590 REM\ CHANGE 5600 TO SELECT MONITOR IN YOUR SYSTEM
5600 FILL 10510,202
9999 END
READY

```


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Apparat's NEWDOS

BY BRYAN MUMFORD

When I first got my level II TRS-80, I was overwhelmed by the size of the language. It seemed as if I would need months to digest all the commands, formats and potential. The presented incredible power for a home computer. But a few weeks later, Level II was old hat and very familiar. When I added a couple of disk drives and TRSDOS, again I was overwhelmed — the abilities of my system jumped a level of magnitude. As it turns out, there are still more significant software improvements available. The comprehensive NEWDOS+ system from Apparat is one of them.

The folks of Apparat modified the existing TRSDOS rather than start from scratch. Thus, the bulk of the system is very familiar. In addition to the large number of new commands and programs, a lot of "fixes" described in their documentation refine the original software to improve on disk I/O errors, file management routines and a number of other awkward areas in TRSDOS. One obvious and popular improvement is the built-in debounce routine for that notorious keyboard. This feature is unquestionably an improvement, though it now becomes mildly annoying to find that some intentional multiple keystrokes are ignored. (What? Me hard to please?)

Those of you who started with a Level I machine and recall fond memories of those primitive days will appreciate a modified version of this language included in NEWDOS. Loaded from disk into RAM, it functions just like the original. Most Level I

programs may be loaded into it as well, though the company disclaims any guarantee that all will. One major improvement, however, is the ability to save Level I programs on disk with a special CSAVE instruction. The data is actually sent to a specific location in RAM and another utility called LV1DSKSL moves this RAM area into a disk file. When loading the program back into LEVEL I, it is first put into RAM with LV1DSKSL; then a special CLOAD instruction reads it from there. Quite an improvement over 250 baud!

Another handy little NEWDOS routine is called the "JKL option", which turns your line printer into a modified screen printer. When the J, K and L keys are depressed simultaneously, none of these letters appear on the video screen but all the other alphanumeric characters are sent to the line printer. Graphics characters appear as periods. This feature works equally well in BASIC or DOS, and is especially useful for printing out copies of disk directories or DEBUG data. The only drawback is that it prints out all 1024 characters, whether they are spaces or not. A Selective printer running at 15 characters a second, takes over a minute to dump the whole screen even if there are only 3 or 4 lines of data. There's nothing like a computer to make you feel a minute is a long time.

You can also print out disk directories with the DIRCHECK command. This module not only prints the contents of the directory, but also the type of program, its protection level, the end of file position and the number of

sectors allocated. This listing may be sent to either the line printer or the video display. In addition, DIRCHECK tests the specified directory for errors; if one is encountered, it is displayed along with its location.

DIRCHECK would be of limited value were it not for yet another new program, this one written in BASIC, with the modest moniker of SUPERZAP. This program gives you direct access to both RAM and disk contents. You can display the hex code for any section of either of these and modify them on a single byte level. Of greatest value, you can now edit disk files directly. At least theoretically, KILLED files may be recovered, "bombed" disks restored, and other kinds of lost data retrieved. The catch (there's always a catch) is that you must first fully understand the structure and function of the various parts of the disk, and this is not a small matter. NEWDOS documentation outlines disk structure, but it's up to you to uncover a lot of the details.

While experimenting with SUPERZAP, I managed to "bomb" the only disk with the original text of this article (in an Electric Pencil file). I could look at the text and restore the directory entry for the text. But I couldn't get the system to read the directory again.

I have, however, been able to eliminate the passwords for BASIC and the system files and reduce their protection levels so that they can be KILLED for more room on disks where they aren't needed. You don't need BASIC on an Electric Pencil disk, for example.

NEWDOS documentation includes guidelines for eliminating system modules and greatly reducing your operating system by KILLing unnecessary files. Also, changing one byte in one module will bypass password checking in general and allow you to KILL or otherwise manipulate any file on any disk, including TRSDOS protected files.

Another interesting and useful SUPERZAP trick lets you modify the text of BASIC programs stored on disk in ASCII format so that they can be read into and edited with Electric Pencil. Normally, Pencil responds with a DOS error if you try to load a BASIC text. Pencil texts of BASIC programs, on the other hand, are easily loaded into Disk BASIC. Also, you can modify data files such as mailing lists to load into Pencil for editing or printing. The trick is to change the last byte of the file to 00 hex. With data lists, just make the last byte you print to the disk file a 0. For BASIC programs, however, you'll need to use SUPERZAP.

An improved version of Radio Shack's Editor/Assembler is built into NEWDOS. The most significant improvement lets you write both source and object code directly to disk, and read source code from disk. It was always a major irritation to me that, even though I could load the Editor/Assembler from disk, I had to dump the assembled data to cassette to test or store it. Also included in NEWDOS, an incredibly fast Z-80 disassembler displays mnemonic code for both RAM and disk data, in its proper location or offset, at a speed so fast it must be told to pause after 16 lines or it's just a blur. The same data may also be sent to the line printer.

One last DOS command and we'll get to BASIC improvements. LMOFFSET reads a file from disk or cassette and re-assigns it to whatever address in high RAM you choose. If it is a relocateable file you can execute it from there. If not, you can add an appendage to the file which will automatically move the file back down to the lower address. Thus, programs that are co-resident with DOS may still be loaded with DOS. When you initially load the program, LMOFFSET tells you where it will load, what its execute address is, and what possible conflicts there will be with your operating system. This feature is useful for determining where to put a particular program. Also, if you have a program that runs fine but you've forgotten where it sits, you can now quickly find out.

Okay, we've gotten the DOS system out of the way, and there are just as many useful improvements to BASIC. The first thing you can now do with BASIC is to run a program, complete with setting memory size and the number of I/O areas, from DOS or even on power-up. Simply enter

```
BASIC 5,40000,RUN"PROGRAM"
and BASIC will load with 5 available
I/O areas and a memory size of 40000.
Then it will load and execute "PRO-
GRAM".
```

In addition, suppose you get a RESET while in BASIC and are returned to DOS. If you immediately enter "BASIC *", you will in most cases be able to return to BASIC with the existing program and data still intact. This trick will also work if you accidentally hit LPRINT (without a printer on line) or CLOAD and have to hit RESET intentionally to free the computer from a locked condition.

Apparat's NEWDOS improves on TRSDOS, adding new commands and programs.

Once in BASIC, you can use several new commands. Abbreviations are now accepted for LIST, EDIT and DELETE. When LISTing, you may scroll up or down a line at a time by hitting the up and down arrows. A really significant improvement is the addition of all DOS commands to BASIC in the CMD"COMMAND" format. You may now request a Directory listing, FREE space available, set the clock or perform any other such command. Control returns to BASIC when the operation is finished. This ability lets you read disk directory listings into a BASIC data base and alphabetize, sort by extension, check for duplication or backups, and generally computerize your program library into a master disk file index. With more than a few disks or several dozen programs, this ability becomes invaluable. If writing a program to do all that does

not seem like good sport to you, one is available from Mumford Micro Systems for \$19.95 (now modified to run in TRSDOS as well).

One of the greatest improvements in NEWDOS BASIC is the resident renumbering function. You can renumber program text in whole or in part to any value in any increment. Renumbering not only cleans up all those odd and irregular line numbers (if you are bothered by such things) but also opens up program lines if you suddenly find that you just *have* to put another statement between two consecutive line numbers. This ability is critical in using the MERGE command; the two programs to be joined may be independently renumbered to non-conflicting values. A special command checks the program text before renumbering for open line references which would "hang-up" the renumbering or the program.

The REF command displays either a full or partial listing of all variables used in the program text along with the line numbers in which they occur. All references to integer values may also be requested, and the list may be sent to the line printer as well as the video screen. This incredible time saver helps prevent the use of the same variable for different functions in long texts.

In addition to the specific functions I have described here, there are many more minor improvements in other parts of NEWDOS+ which are too numerous to go into. NEWDOS is a very comprehensive package and a major improvement to TRS-80 systems.

In addition to the software improvements, the documentation supplies some very useful information about the inner workings of the disk system. Paradoxically, my major complaint about NEWDOS is the documentation. It's hard to read because of poor print quality (dot matrix). Even though a lot of information is provided, it's written in a vague and confusing manner. You can expect to do a little studying to figure it all out.

Also, the price tag (\$99) seemed high at first; but after using NEWDOS, I would hate to do without it. I also have TRSDOS 2.1, TRSDOS 2.2, and DOS 3.0 and the only one I use is NEWDOS.

A lot of work has gone into this system, but I believe it's worth it. □
NEWDOS+ costs \$99 in a 35-track version, and \$110 in a 40-track version. Contact Apparat at 6000 E. Evans Ave., Denver, CO 80222; (303) 758-7275. Write to Mumford Micro Systems at Box 435, Summerland, CA 93067.

Part 2 Drawing Three-Dimensional Objects

—BY JOHN W. ROSS—

In Part 1 of "Drawing Three Dimensional Objects" (November *PC*), I presented a BASIC program for making perspective drawings of simple 3-D objects. As we saw though, when the object gets complex, the drawing can become rather confusing. Here, I'll present two methods for overcoming this ambiguity: hidden line removal and the construction of stereo pairs.

The Hidden Line Problem

First, I'll illustrate the visual confusion that can result when a complex object is drawn. Figure 1, a polyhedron, has 12 faces, 20 vertices and 30 edges. Notice that it's not possible to tell what is the front and what is the back — it's not even obvious that this is a three-dimensional object. Now look at Figure 2. This is the same view, but the edges that would be hidden if the object were solid have not been drawn this time. I am sure you will agree that this drawing is a considerable improvement.

Removing hidden lines is a problem that has received much attention from people involved with computer graphics. Many complex solutions have been proposed, but I will deal with a simple technique. Unfortunately, we do not get something for nothing, and its scope is limited; it will only work consistently for a certain class of objects — convex polyhedra.

To illustrate a convex polyhedron, I will use the two-dimensional analogue, the convex polygon, shown in Figure 3. Briefly, a convex polygon has no reentrant sides. The way to test a polygon is to imagine any two points lying within its boundary and a straight line joining them. If, for all such pairs of points, the line joining them does not intersect the boundary anywhere, then the polygon is convex. Clearly, the polygon in Figure 3 passes this test while that in Figure 4 does not. The extension to three dimensions and a convex poly-

hedron is straightforward. A cube and the object in Figure 2 are two examples of convex polyhedra.

We restrict ourselves to convex polyhedra because, when we look at one, all the faces are either visible or not visible. For any other object, some faces may obscure parts of other faces resulting in partially visible faces. If we know that we will see all or none of a face, we can test each face for visibility from a particular viewpoint and draw it or not draw it as the case may be. This restriction does not mean that we cannot draw non-convex objects, just that the hidden line removal algorithm will not be able to cope with partially visible faces. For this case we need more complicated edge inspection techniques which will not be considered here. As I said, this is the price of simplicity.

What we need, then, is a test which tells us if a face is visible or not from a particular location. Therefore, we need a bit of vector geometry. The normal vector of a face is any vector perpendicular to that face. The inward normal is one which points toward the center of the object. So, for each face, we construct its inward normal. Next, vectors from the observer to some point on each face are constructed. For each face we now have two vectors — its normal and one from the observer. The angle between these vectors is then computed. If the face is a "back" (and thus invisible) face, this angle is greater than 90° . For a front, or visible face it is less than 90° ; and for a face seen edge-on it is equal to 90° .

The program implements this test in the following way: First, an array H is defined with one element for each face. The elements of this array are assigned zero if the face is hidden or one if it is visible. When we come to draw faces, the appropriate element of array H is examined to see if the face should be drawn or not. If we do not wish to remove hidden lines, we simply set

each element of H to one.

The incorporation of hidden line removal into the program is quite simple and causes few changes. The Program Listing gives the entire program, including these changes. Note, in lines 140 and 380, the addition of array H. Line 1450 examines array H to see if a face should be drawn. H is calculated by a 34-line piece of code inserted between old line numbers 1070 and 1080 (lines 1080 to 1410 in the Program Listing). Lines 1080 to 1130 determine if hidden lines are to be removed. Lines 1140 to 1290 construct the inward normal to a face, while the vector from the observer to the face is determined in lines 1300 to 1330. The angle between the vectors is calculated in line 1340 and the appropriate test made in lines 1350 to 1400. To make this test we also need to know if the vertices on the face were ordered clockwise or counterclockwise — indicated by the variable W.

Stereoscopic Images

While removing hidden lines makes the drawings less ambiguous, we lose some of the original three-dimensional information about the object that we passed to the program. We may recover this information with the use of stereo pairs.

When we look at an object reasonably close to us, each eye sees a slightly different view of the object. The two images are then integrated by the brain and we perceive the object with depth. This process has been simulated with stereo photography, where two photos are made of a scene with lenses separated by some distance. When you look at these two photos with a viewer to ensure that each eye sees only the appropriate photo, the original scene is recaptured in three dimensions. This process is used in making aerial photographs.

We may recreate this process by

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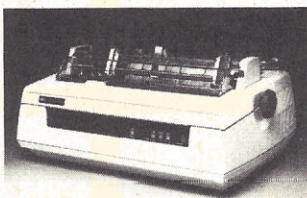
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drawing our object from some viewpoint, then drawing it from another viewpoint which is rotated about the z-axis of the coordinate system by a few degrees. (See Figure 5.) The two drawings form a stereo pair. For instance, say our first viewpoint is at coordinates (x_0, y_0, z_0) and we wish to find another one separated by θ degrees. If the coordinates of this second location are (x_1, y_1, z_1) then

$$x_1 = x_0 \cos \theta - y_0 \sin \theta$$

$$y_1 = x_0 \sin \theta + y_0 \cos \theta$$

$$z_1 = z_0$$

The severity of the stereo effect depends on the angle θ , as illustrated in Figures 6 and 7. Figure 6 is a cube drawn with a viewpoint separation of 2° and Figure 7 is the same cube with a separation of 9° . Generally, an angle of 3° or 4° produces the most natural results.

I would like to make a brief aside here on how to use stereo pairs. While it is customary to look at them with some kind of viewer, it is not necessary. With concentration, you can perceive the stereo images unaided. The drawings should be small enough so that when placed side by side, similar points are no more than three or four inches apart. To see the three dimensional image, hold the drawings at a comfortable viewing distance, then let your eyes "cross" so that the two images superimpose (your eyes are now actually focused below the plane of the stereo pair). Hold this composite image until you see it in 3-D. You should be able to do this with the stereo pairs accompanying this article. It's hard to do at first, but becomes easy with practice.

The program can produce stereo pairs if the following general modifications are made: Reduce the drawing in scale so that it is only a couple of inches across. Compute a second viewpoint, then make a drawing from this viewpoint, using the same scale factor, beside the first. These two should be as close as possible without overlapping. The program modifications are elementary. With practice, it is possible to see the three dimensional image actually floating before you on the screen. Figures 8, 9 and 10 are stereo pairs made in this manner with an angular separation of 3° using the object in Figure 1. Notice that it is not necessary to remove hidden lines when the object is seen this way—there is no ambiguity. When making stereo pairs, since the hidden lines can be left in, it does not matter if the object is a convex polyhedron or not.

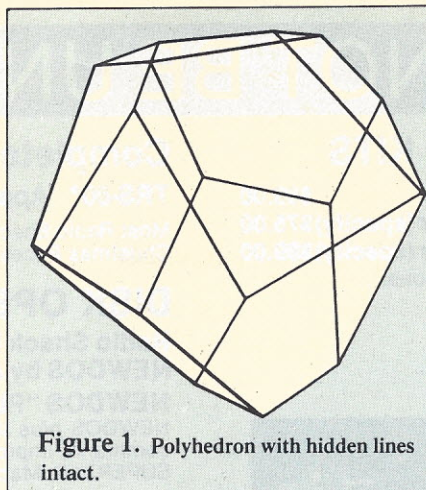


Figure 1. Polyhedron with hidden lines intact.

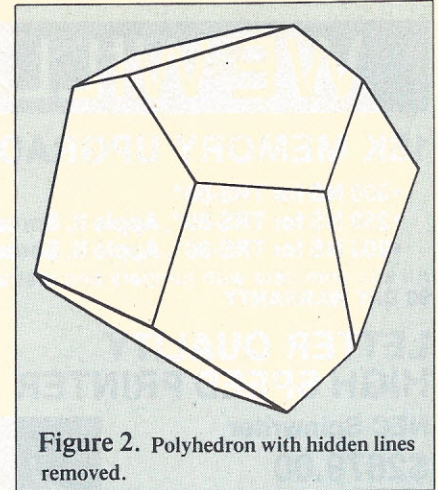


Figure 2. Polyhedron with hidden lines removed.

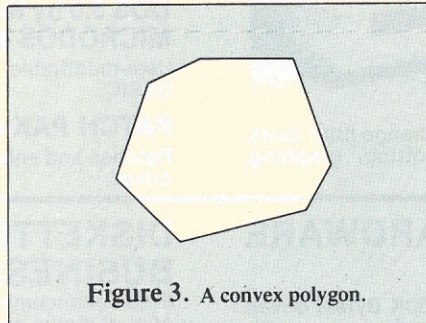


Figure 3. A convex polygon.

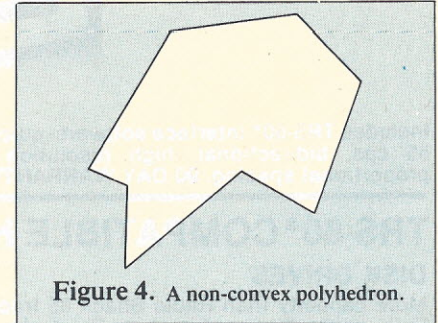


Figure 4. A non-convex polyhedron.

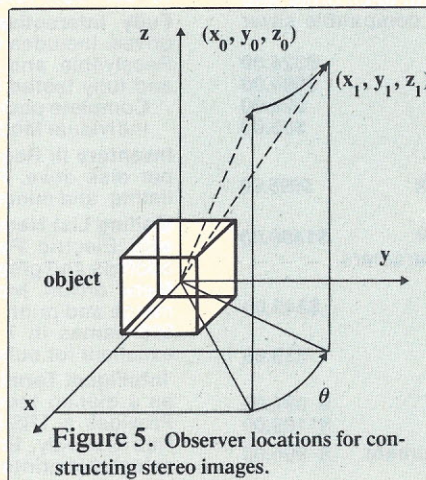


Figure 5. Observer locations for constructing stereo images.

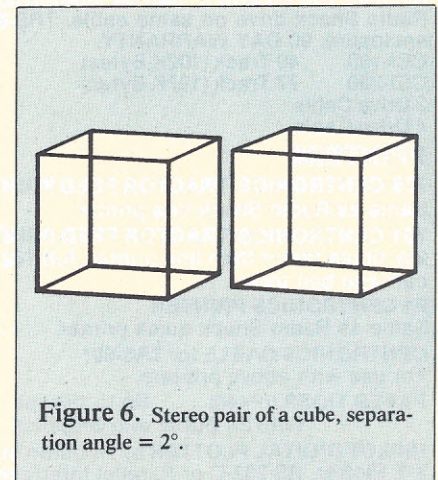


Figure 6. Stereo pair of a cube, separation angle = 2° .

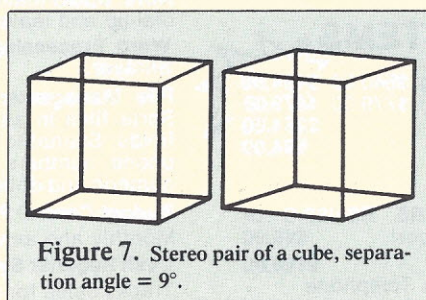


Figure 7. Stereo pair of a cube, separation angle = 9° .

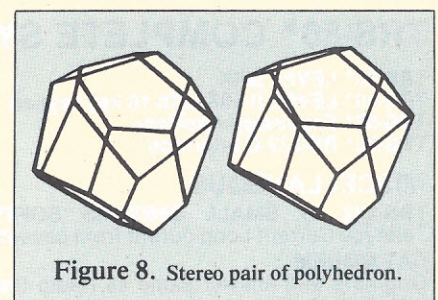


Figure 8. Stereo pair of polyhedron.

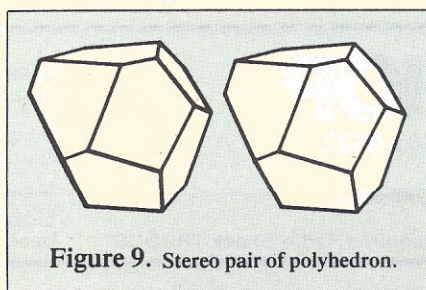


Figure 9. Stereo pair of polyhedron.

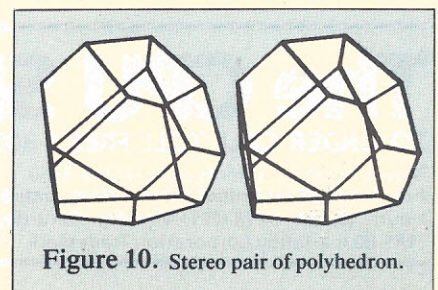


Figure 10. Stereo pair of polyhedron.

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Notes and Applications

You may have noticed that the observer locations specified for many of the drawings are quite distant from the actual object. This is intentionally done to prevent perspective distortion, often seen in photographs. In fact, since cameras also render images in true perspective; this program will mimic the operation of a camera. The focal length of our "lens" in this case is controlled by the distance between the observer and the point looked at. Figure 11 is a 2

x 2 x 2 cube seen from location (100, 60, 40). (Recall that these are distances along an orthogonal set of coordinate axes whose origin is located at the center of the cube). This figure corresponds to a photograph made from a long distance with a telephoto lens and appears to be a natural representation of the cube. Figure 12, the same cube from location (3.75, 2.25, 1.5), appears distorted. This is precisely the type of distortion seen in photographs made with very wide angle lenses held close to the subject.

Also note that in all cases we have been looking at the center of the object — again to prevent a type of distortion often seen in photography. For example, Figure 13 is the same cube, seen from the same level as the near, bottom corner while looking at that corner. Since the image plane is parallel to the sides they appear straight and the cube is undistorted. In Figure 14 the observer position remains the same but now we are looking at a point above the cube, thus tilting the image plane. Note the sloping sides, an effect often seen in

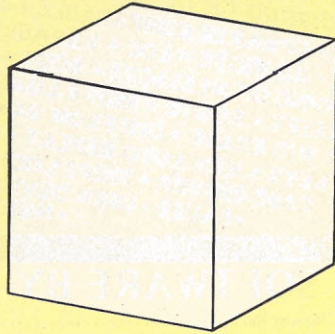


Figure 11. Cube viewed from far away.

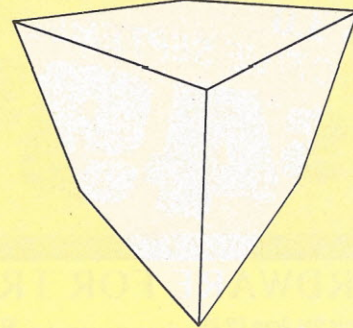


Figure 12. Cube viewed from nearby.

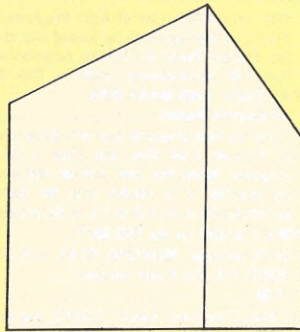


Figure 13. Cube seen with parallel image plane.

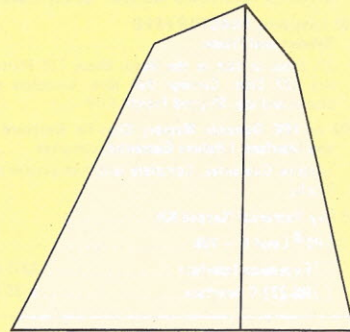


Figure 14. Cube seen with tilted image plane.

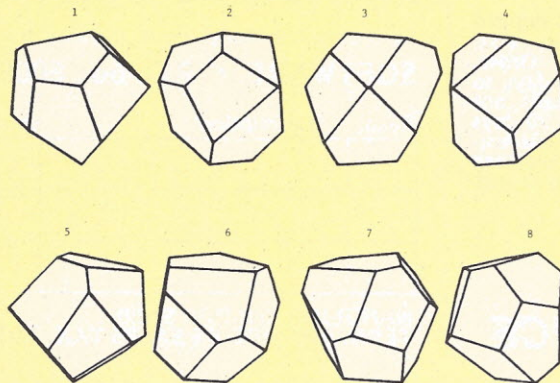


Figure 15. Polyhedron showing rotation in 45° increments.

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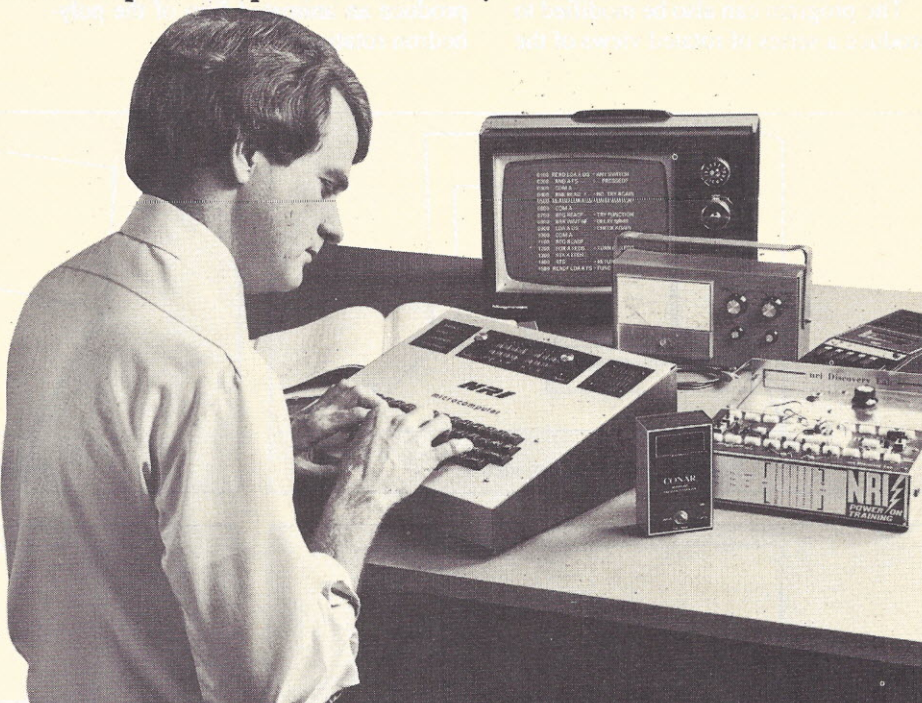
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photographs of tall buildings made by tilting the camera up. Thus, observer location and point looked at are two parameters that can radically influence the portrayal of an object. If you are interested in photography, you can simulate the operation of lenses with focal lengths from ultra-wide angle to super-telephoto. Interesting effects are produced by drawing even a simple cube and varying these parameters, especially if done in stereo.

The program can also be modified to produce a series of rotated views of the

object at one time. Figure 15 shows a series of views of the familiar polyhedron. As we proceed from view 1 to 8, the object appears to rotate in 45° increments (clockwise from the top). This was done by rotating the observer position in the opposite direction, just as we did for the stereo pairs. If the increments were made much smaller, and the drawings photographed one at a time on a movie camera capable of making single exposures, you could produce an animated film of the polyhedron rotating.

Figures 16 to 19 are views of a representation of my bedroom. (Incidentally, this is definitely not a convex polyhedron.) The rectangular object in the center is the bed. It's a simple matter to change the coordinates of the points representing the bed, thereby moving it around the room (see Figure 19). Here we have a method for rearranging furniture to judge the effect without the danger of strained muscles.

I hope you have been able to see the possibilities of this program. I'm sure there are many I haven't thought of. □

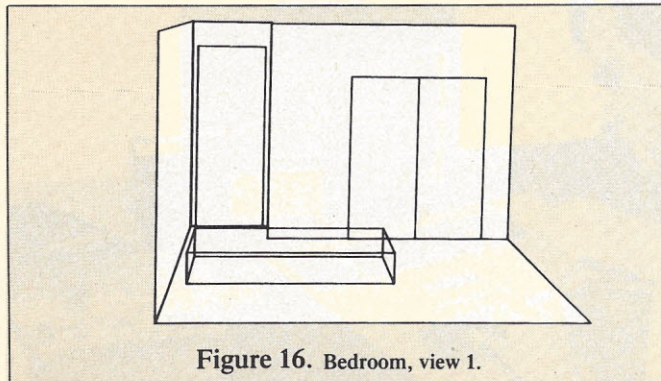


Figure 16. Bedroom, view 1.

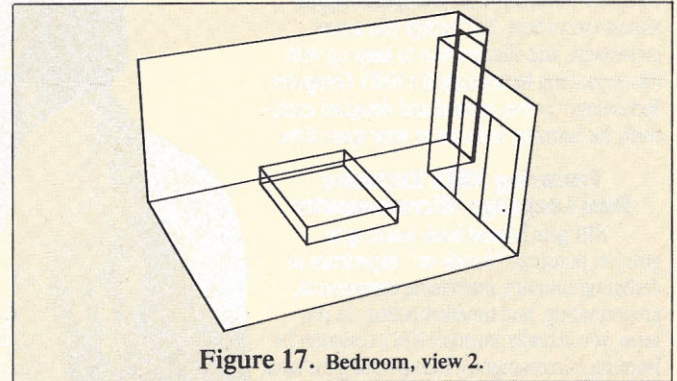


Figure 17. Bedroom, view 2.

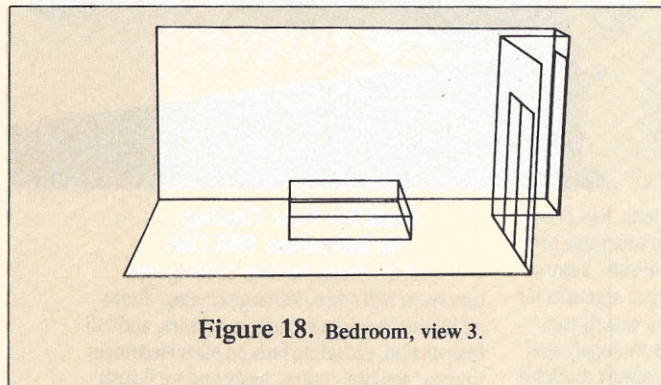


Figure 18. Bedroom, view 3.

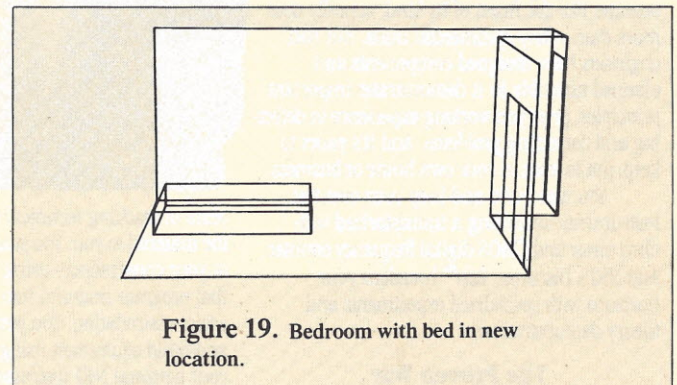


Figure 19. Bedroom with bed in new location.

Program Listing

```
50 REM POLYHEDRON PLOTTER
100 DIM D(6),Q(3),C(3),U(3),A(3),V(3)
110 VIEWPORT 5,125,5,95
120 WINDOW 0,12,0,9
130 PAGE
140 DELETE X,Y,Z,P,F,U1,H
150 PRINT "POLYHEDRON PLOTTING SYSTEM"
160 REM IN THIS SECTION POLYHEDRON DATA IS INPUT
170 PRINT "INPUT # OF VERTICES ";
180 INPUT N0
190 DIM X(N0),Y(N0),Z(N0),P(N0,2)
200 PRINT "INPUT CARTESIAN COORDINATES OF"
210 PRINT "POLYHEDRON CENTRE"
220 INPUT C1,C2,C3
230 PRINT "INPUT COORDINATES OF EACH VERTEX IN FORM OF"
240 PRINT "X,Y,Z TRIPLETS"
250 PRINT "VERTEX"
260 REM GET COORDINATES AND TRANSLATE TO ORIGIN
270 FOR I=1 TO N0
280 PRINT I;": ";
290 INPUT X(I),Y(I),Z(I)
300 X(I)=X(I)-C1
310 Y(I)=Y(I)-C2
320 Z(I)=Z(I)-C3
330 NEXT I
340 REM GET FACE ARRANGEMENT
```

```
350 PRINT "NOW YOU MUST ENTER FACE ARRANGEMENT"
360 PRINT "INFORMATION"
370 PRINT "HOW MANY FACES ARE THERE? ";
380 INPUT N1
390 PRINT "WHAT IS THE MAXIMUM NUMBER OF VERTICES"
400 PRINT "ON A FACE? ";
410 INPUT N2
420 DIM F(N1,N2),U1(N1),H(N1)
430 PRINT "WHEN A FACE NUMBER APPEARS--INPUT ITS"
440 PRINT "VERTEX NUMBERS"
450 PRINT "ORDERED CYCLICALLY (THESE ARE ENTERED"
460 PRINT "ONE PER LINE)"
470 PRINT "IF A FACE HAS LESS THAN THE MAX # OF"
480 PRINT "VERTICES - ENTER 0"
490 PRINT "AS THE LAST VERTEX NUMBER"
500 FOR I=1 TO N1
510 PRINT "FACE ";I;": ";
520 FOR J=1 TO N2
530 INPUT F(I,J)
540 IF F(I,J)=0 THEN 500
550 NEXT J
560 J=N2+1
570 U1(I)=J-1
580 NEXT I
590 REM START A NEW PLOT
600 PAGE
610 PRINT "NEW PLOT - SPECIFY THE FOLLOWING : ";
620 PRINT "OBSERVER LOCATION, POINT LOOKED AT"
630 INPUT D
640 D0=1
650 REM PERFORM PERSPECTIVE TRANSFORMATION
660 U(1)=D(4)-D(1)
670 U(2)=D(5)-D(2)
680 U(3)=D(6)-D(3)
```


Program Listing continued

```

620 U1=SQR(U(1)*U(1)+U(2)*U(2)+U(3)*U(3))
630 FOR I=1 TO 3
640 C(I)=U(I)/U1
650 NEXT I
660 S3=SQR(1-C(3)*C(3))
670 S2=SQR(1-C(2)*C(2))
680 FOR I=1 TO 3
690 Q(I)=D(I)+D0*C(I)
700 NEXT I
710 FOR I=1 TO N0
720 U(1)=X(I)-D(1)
730 U(2)=Y(I)-D(2)
740 U(3)=Z(I)-D(3)
750 REM CHECK FOR VALID VIEWPOINT
760 IF U(1)*U(1)+U(2)*U(2)+U(3)*U(3)>0 THEN 810
770 PRINT "VIEWPOINT WITHIN OBJECT - PLOT ABANDONED"
780 PRINT "HIT RETURN TO CONTINUE"
790 INPUT A$
800 GO TO 530
810 K=D0/(U(1)*C(1)+U(2)*C(2)+U(3)*C(3))
820 FOR J=1 TO 3
830 A(J)=D(J)+K*U(J)
840 NEXT J
850 IF S3=0 THEN 890
860 P(1,1)=((A(1)-Q(1))*C(2)-(A(2)-Q(2))*C(1))/S3
870 P(1,2)=(A(3)-Q(3))/S3
880 GO TO 910
890 P(1,1)=((Q(1)-A(1))*C(3)+(A(3)-Q(3))*C(1))/S2
900 P(1,2)=(A(2)-Q(2))/S2
910 NEXT I
920 REM SCALE THE DATA SO IT FITS INTO A 12X9 AREA
930 X1=P(1,1)
940 X2=P(1,1)
950 Y1=P(1,2)
960 Y2=P(1,2)
970 FOR I=2 TO N0
980 X1=X1 MIN P(I,1)
990 X2=X2 MAX P(I,1)
1000 Y1=Y1 MIN P(I,2)
1010 Y2=Y2 MAX P(I,2)
1020 NEXT I
1030 T=9/(Y2-Y1) MIN 12/(X2-X1)
1040 FOR I=1 TO N0
1050 P(I,1)=(P(I,1)-X1)*T
1060 P(I,2)=(P(I,2)-Y1)*T
1070 NEXT I
1080 REM FLAG FACES WHICH ARE HIDDEN

```

```

1090 PRINT "SHOULD HIDDEN LINES BE REMOVED? (Y OR N) ";
1100 INPUT A$
1110 FOR I=1 TO N1
1120 H(I)=1
1130 IF A$="N" THEN 1410
1140 I=F(I,1)
1150 J=F(I,2)
1160 K=F(I,3)
1170 A1=(Y(K)-Y(J))*Z(I)-Z(J)-(Z(K)-Z(J))*Y(I)-Y(J)
1180 A2=(Z(K)-Z(J))*X(I)-X(J)-(X(K)-X(J))*Z(I)-Z(J)
1190 A3=(X(K)-X(J))*Y(I)-Y(J)-(Y(K)-Y(J))*X(I)-X(J)
1200 A4=SQR(A1*2+A2*2+A3*2)
1210 B1=(X(I)+X(K))/2
1220 B2=(Y(I)+Y(K))/2
1230 B3=(Z(I)+Z(K))/2
1240 B4=SQR(B1*2+B2*2+B3*2)
1250 P1=-(A1*B1+A2*B2+A3*B3)/(A4*B4)
1260 W=0
1270 IF P1>0 THEN 1290
1280 GO TO 1300
1290 W=1
1300 G1=B1-D(1)
1310 G2=B2-D(2)
1320 G3=B3-D(3)
1330 G4=SQR(G1*2+G2*2+G3*2)
1340 P1=(A1*G1+A2*G2+A3*G3)/(A4*G4)
1350 IF W=1 THEN 1380
1360 IF P1>0 THEN 1400
1370 GO TO 1410
1380 IF P1<0 THEN 1400
1390 GO TO 1410
1400 H(I)=0
1410 NEXT I
1420 REM DRAW THE POLYHEDRON
1430 PAGE
1440 FOR I=1 TO N1
1450 IF H(I)=0 THEN 1520
1460 K=F(I,1)
1470 MOVE P(K,1),P(K,2)
1480 FOR J=2 TO U(I)
1490 DRAW P(F(I,J),1),P(F(I,J),2)
1500 NEXT J
1510 DRAW P(K,1),P(K,2)
1520 NEXT I
1530 MOVE -0.5,9.5
1540 PRINT "PARAMETERS : ";
1550 PRINT D(1);D(2);D(3);D(4);D(5);D(6);
1560 PRINT " . . . ANOTHER PLOT? (Y OR N) ";
1570 INPUT A$
1580 IF A$="Y" THEN 530
1590 END

```

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They don't require any circuit changes, are easy to install, and they don't interfere with the normal operation of your TRS-80*. All your original software will still run properly. Omikron products require a minimum of 16K memory and the TRS-80* Expansion Interface.

★ ★ ★

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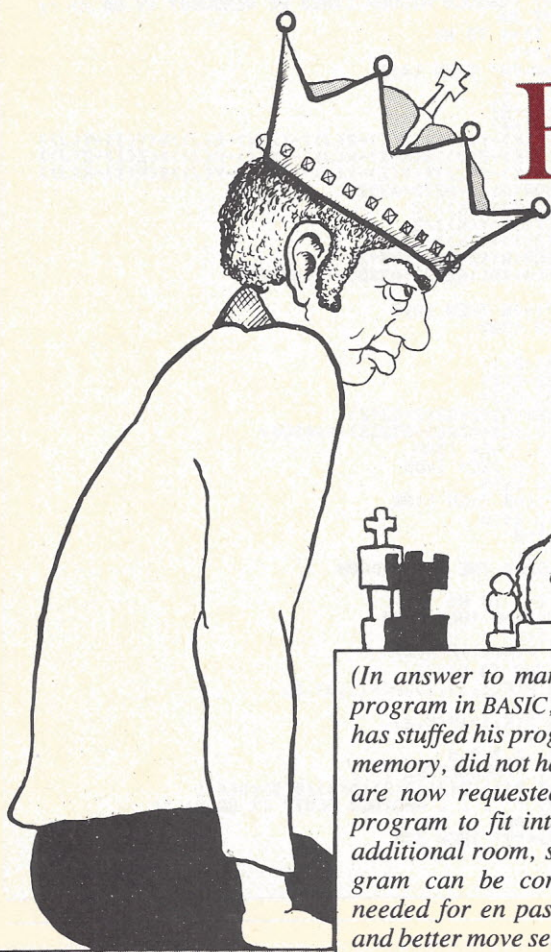
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BASIC Chess



(In answer to many queries of readers asking for a chess program in BASIC, Mike McCann has come up with one. He has stuffed his program into an 8K Pet and, having run out of memory, did not have room to sharpen the play. Subroutines are now requested from readers to upgrade the McCann program to fit into 16K, 32K or even 48K memory. With additional room, some of the weaknesses in this BASIC program can be corrected. For example, sub-routines are needed for en passant captures, castling, piece evaluation and better move selection. When readers have sharpened this program, we will give it a nice name and enter it in competition against Boris, Chess Challenger, Sargon, and, perhaps, some of the big guys. Please send your sub-routines to Chess Section, Personal Computing, 1050 Commonwealth Ave., Boston, MA 02215. Can we disprove the old saw that says decent chess programs can't be written in BASIC?)

Steve Fischer

—BY MICHAEL J. MCCANN—

One of the most interesting aspects of personal computing for me is programming microcomputers to play complicated games. So, when I found myself with two weeks between semesters (I am a computer science student at State University of NY of Buffalo) I decided to fulfill a longstanding ambition of mine, to write a chess program even though I am not a good chess player. Because I lacked a good symbolic assembler and had never attempted to create a program as complicated as this, I decided to write the program in BASIC.

The program requires nearly all of the memory available on my 8K Pet. When the program is running, only 4 bytes are left in BASIC's workspace. In addition both cassette buffers are used to store lists of moves. Locations 634 thru 783 are used to store possible moves for the computer and locations

784 thru 933 are used to store possible moves for the opponent. Possible moves are stored as ordered pairs. In addition, locations 934 thru 941 are used by a subroutine which determines if white or black is in check. In line 25 of the program two functions are defined (FNX and FNY) which are used throughout the program to recover co-ordinates.

Possible move storage is in this format:

```
Starting Point
(X * 10) + Y = PEEK (BA+INDEX)
Stopping Point
(XD * 10) + YD = PEEK (BA+
INDEX+75)
```

Where (X,Y) is the starting point, (SD,YD) is the stopping point, and BA is an address.

The program plays a modified ver-

sion of chess. Capture en passant and castling are not supported by the program. When one of the opponent's pawns reaches the end of the board the opponent is allowed to substitute a queen or a knight for the pawn. When one of the computer's pawns reaches the end of the board a queen is substituted. In all other respects the program plays chess according to normal rules.

Moves entered by the opponent are entered in algebraic fashion. The squares on the board are labeled on the horizontal axis with the letters A-H, and on the vertical axis with the numbers 1-8. When entering a move you first give the computer the current position of the piece you want to move followed by the position that you would like to reach. As an example, if you wanted to move a piece for location (E,7) to location (E,5) you would enter E,7,E,5 in response to the computer's

prompt to enter your move.

When the opponent's move is entered and found legal the program generates a list of possible replies. The move generation subroutines do not take into consideration whether or not a given move will place the computer in check. Therefore, when a move is under consideration it is tested by a subroutine beginning in line 13400. This subroutine operates by looking at lines of attack on the king (horizontal, vertical, and diagonal) and deciding if an enemy piece is on a given line of attack; for example, an enemy rook on an horizontal line of attack.

Because knights can jump over pieces, special coding is required to determine if one of the opponent's knights is in a position to attack. There are at most eight possible moves for a knight from a given position. The knight's move can be reversed by determining possible moves for an hypothetical knight from the king's current position. Final positions of the hypothetical knight are then checked to see if any enemy knights have placed the king in check.

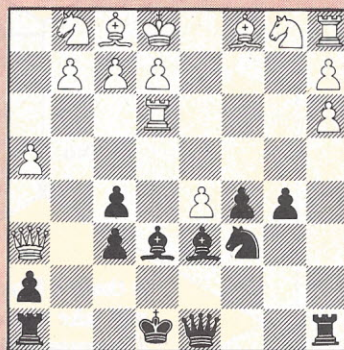
If the subroutine beginning in line 13400 finds that the king is in check that fact is passed to the calling routine by making the value of variable AN\$="Y". If the subroutine finds that the king is not in check then the variable becomes AN\$="N". Several subroutines in the program use AN\$ to pass to calling routines the answers to various tests.

The subroutines that begin in lines 11100, 11200, and 13800 use AN\$ in the same fashion as the subroutine beginning in line 13400. The subroutine in line 11100 returns a yes or no answer (in AN\$) to the question: is one of the opponent's pieces at location (X,Y)? X and Y are program variables which are used to transfer coordinates to routines. As you can see in the listing, the subroutine beginning in line 11100 can be switched with variable BA to consider whether the computer or the opponent is the "other side". The subroutines beginning in lines 11200 and 13800 are used in the same way as the subroutine beginning in line 11100. The move generating subroutine along with the routines called by the move generating subroutine can be switched with variable BA to generate lists of possible moves for the computer or the opponent. The subroutine that determines if the king is in check can be switched with variable BA to look for threats on the computer's king or the opponent's king. It is necessary to

White-
HUMAN (Moves first)

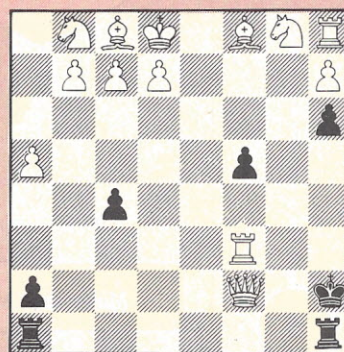
Black-
McCANN BASIC
CHESS PROGRAM
(Colors are reversed)

- | | | |
|-----|-------|-------|
| 1. | e7e5 | f2f4 |
| 2. | e8e6 | e2e4 |
| 3. | e6c6 | d2d4 |
| 4. | e5:d4 | c2c4 |
| 5. | a7a5 | glf3 |
| 6. | a8a6 | blc3 |
| 7. | c6c5 | fld3 |
| 8. | d4:c3 | b2:c3 |
| 9. | a6d6 | cle3 |
| 10. | c5a3 | h2h4 |
| 11. | f7f5 | h4h5 |
| 12. | f5:e4 | h5h6 |



The computer has already moved all but one of its pawns. A foolhardy and fatal strategy.

- | | | |
|-----|--------|-------|
| 13. | g7:h6 | g2g4 |
| 14. | e4:f3 | g4g5 |
| 15. | f3f2 | g5:h6 |
| 16. | f2:el+ | dl:el |
| 17. | a3:c3+ | e3d2 |
| 18. | c3:d3 | d2e3 |
| 19. | d6e6 | f4f5 |
| 20. | e6:e3+ | elf2 |
| 21. | e3f3+ | f2gl |
| 22. | d3e3+ | glh2 |
| 23. | e3f2++ | |



Position at end of game. The computer demonstrates the art of committing suicide.

switch in order to determine if the opponent's move is legal.

A large part of the program is devoted to routines that generate lists of legal moves. In fact, the large amount of memory required by the move generating routines has severely limited the amount of memory that could be devoted to selecting the computer's move.

The method of selecting moves is very simple (see flowchart). However, the program for the most part, plays a reasonable game of chess. This is how the computer picks its move: first, the computer goes down its list of possible moves and looks for a move that will place one of its pieces in the center of the board. Because of the order in which moves are listed the computer will tend to first bring out its pawns, then its knights and then its bishops. This results in good development on the computer's part. If the machine cannot find a move that will place one of its pieces in the center of the board it will look for a move that will capture any of the opponent's pieces (except pawns). Because of the order in which moves are listed the computer will favor a capture that will involve one of its less-valued pieces. If the computer cannot find a move that fits the above criteria it will make the first move it finds that will not place the computer in check. If the computer cannot find a move, that will not place the computer in check, then the computer concedes the game.

This program can be converted to run on 16K Level II TRS-80. You will have to change all the INPUT #'s in the program to INPUT, eliminate the following from line 25 DEF FNX(X)=INT(X/10):DEF FNY(X)=X-FNX(X)*10:OPEN 1,0,0, and change the value of variable BA to some unused area of the TRS-80's memory. Since level II BASIC does not permit the user to define functions you will have to substitute INT(X/10) in each spot where FNX(X) appears and substitute X-INT(X/10)*10 in each spot where FNY(X) appears. Change line 14080 to read 14080 A\$ INKEY\$:IF A\$="" GOTO 14080.

(In the program, colors of players are reversed, with queens still on their own color. There is no opening book; hence, the startling pawn activity seen in sample game. The computer's overwhelming compulsion to move its pawns is disastrous. By move 14 the computer has already sent five of its pieces to a needless, early grave. A sharp subroutine from the readers will, of course, change all this flub-a-dub. — Ed.)

SUBROUTINES

10100 - init. board
 10300 - display board
 10600 - enter a possible move into a tape buffer
 11100 - one of the other guys?
 11200 - one of us?
 11300 - enter a move on B\$()
 11500 - list locations of a given type of computer piece
 11600 - find all possible moves for a pawn (computer's)
 11700 - is there a piece at a given location
 11800 - store X and Y in XT and YT
 11900 - find all possible moves for a knight
 12200 - find all possible moves for a king
 12300 - find all possible moves for a rook
 12600 - find all possible moves for a bishop
 12800 - find all possible moves
 13000 - find all possible moves for a pawn (opponent's)
 13300 - input move from keyboard
 13400 - is the king in check?
 13800 - the other guy's piece of a given type?
 13900 - restore B\$()
 14000 - pawn promotion

VARIABLES

B\$() - chess board
 LC\$() - list of computer's pieces
 LH\$() - list of opponent's pieces
 MI - index
 CL\$ - color of opponent's pieces
 AN\$ - reply
 (X,Y) - starting point
 (XD,YD) - stopping point
 SI - index
 P - piece type
 X(),Y() - locations of a given type piece
 XT,YT-temp. storage for X and Y
 BA - base address

Program Listing

```
10 REM(C)1978, MICHAEL J. MC CANN
25 DEFNFX(X)=INT(X/10):DEFNFX(X)=X-FNX(X)
X)*10:OPEN1,0,0:DIMB$(8,8),LH$(8),LC$(8)
```

```
33 FORJ=1TO8:FORI=1TO8:B$(I,J)=".":NE
XTJ,E:PRINT
80 PRINT"CHESS 1.0":PRINT:PRINT"COLOR O
F YOUR CHESSMEN? (W/B)":PRINT
90 INPUT#1,CL$:IF(CL$<>"W"ANDCL$<>"B")O
RCL$="":THENPRINT"":GOTO33
100 IFCL$="W"THENOP=1:PL=2:GOSUB10100:O
P=8:PL=7:GOSUB10100
130 IFCL$="B"THENOP=8:PL=7:GOSUB10100:O
P=1:PL=2:GOSUB10100
145 RESTORE:IFCL$="B"THENGOSUB190:GOSUB
160
146 IFCL$="W"THENGOSUB160:GOSUB190
150 GOTO500
160 FORI=1TO6:READLC$(I):NEXT:RETURN
190 FORI=1TO6:READLH$(I):NEXT:RETURN
500 IFCL$="B"THENMI=0:BA=634:GOSUB12800
:CI=MI-1:GOTO655
540 GOSUB14000:GOSUB 13300:TI$="000000"
```

```
550 MI=0:BA=784:GOSUB12800
570 FG=0:FORZ=0TO9:1-A=FNX(PEEK(BA+Z)):
B=FNX(PEEK(BA+Z)):
580 C=FNX(PEEK(BA+75+Z)):D=FNX(PEEK(BA+
75+Z)):
590 IFXI=ARNDYI=BRNDXS=CANDYS=DTHENFG=1
:Z=MI
610 NEXT:IFFG=0GOTO17000
620 X=A:Y=B:XD=C:YD=D:GOSUB11300
630 MI=0:BA=784:GOSUB13400
640 IFAN$="Y"THENGOSUB13900:GOTO17000
650 GOSUB14000:GOSUB13300:BA=634:MI=0:G
OSUB12800:CI=MI-1:MI=0
655 FL=0:GOSUB760:IFFL=1THENBP=634:MI=0
:GOSUB13400:IFAN$="Y"THENGOSUB13900:FL=0
656 IFFL=1GOTO540
657 BA=634:GOSUB810:IFFL=1THENBP=634:MI
=0:GOSUB13400:IFAN$="Y"THENGOSUB13900:FL
=0
658 IFFL=1GOTO540
659 BA=634:GOSUB830:IFFL=1GOTO540
660 GOTO15000
760 FORP=2TO5:FORZ=0TO9:GOSUB16000:IFB
$(XD,YD)=LH$(P)THENGOSUB11300:P=5:PL=2:Z
=CI
770 NEXT:NEXT:RETURN
810 BA=634:FORZ=0TO9STEP-1:GOSUB16000
```

```
815 IFXD<7ANDXD>2ANDYD<7ANDYD>2AND(YC30
RYD6)ANDB$(X,Y)OLC$(1)THENGOSUB11300:FL
=1:Z=0
820 NEXT:RETURN
830 FL=0:BA=634:FORZ=0TO9STEP-1:M=Z:GO
SUB16000:GOSUB11300:GOSUB13400:Z=M
835 IFAN$="Y"THENGOSUB13900:GOTO840
836 FL=1:Z=0
840 NEXT:RETURN
999 PRINTTAB(3):FORI=1TO31:PRINT"0":N
EXT:PRINT:RETURN
10100 READA$:B$(4,OP)=A$:READB$(5,OP):R
EADA$:B$(1,OP)=A$
10180 B$(8,OP)=A$:READA$:B$(3,OP)=A$:B$
(6,OP)=A$:READA$:B$(2,OP)=A$
10240 B$(7,OP)=A$:READA$:FORI=1TO8:B$(E
,PL)=A$:NEXT:RETURN
10300 POKE59489,228:PRINT"":PRINT"OPPO
N ENT":GOSUB999
10320 FORI=0TO1STEP-1:PRINT:FORJ=1TO8
:PRINTB$(J,E)SPC(1):NEXT:PRINT:PRINT:NE
XT
10385 PRINT"":GOSUB999:PRINTTAB(3)"A
B C D E F G H"
10390 PRINT"COMPUTER":POKE59489,60:RETU
RN
10500 FORI=1TO8:FORJ=1TO8:SP$(I,J)=B$(E
,J):NEXTJ,E:RETURN
11000 IFX>8ORX<1ORY>8ORY<1ORX<1ORX>8OR
RYT>8ORY<1THENRETURN
10610 PRINT"TIME:TI$:IFSW=1THENPOKE934
+MI,X*10+Y:MI=MI+1:RETURN
11000 POKEBA+MI,X*10+Y:POKEBA+75+MI,X
*10+Y:MI=MI+1:RETURN
11100 AN$="N":IFX>8ORX<1ORY>8ORY<1THEN
RETURN
11120 FORI=1TO6:IFBA=634THENAN$=LH$(I)
11122 IFBA=784THENAN$=LC$(I)
11130 IFAN$=B$(X,Y)THENAN$="Y"
11150 NEXT:RETURN
11200 AN$="N":IFX>8ORX<1ORY>8ORY<1THENR
ETURN
11220 FORI=1TO6:IFBA=634THENAN$=LH$(I)
11222 IFBA=784THENAN$=LC$(I)
11230 IFAN$=B$(X,Y)THENAN$="Y":E=7
11250 NEXT:RETURN
11300 X=X:Y=Y:E=E:B$(XD,YD)=B$(XD,YD)=
B$(X,Y):B$(X,Y)=":RETURN
11500 FORLL=1TO9:X(LL)=0:Y(LL)=0:NEXTLL
11505 SI=1:FORLL=1TO8:FORJ=1TO8
```

```
11520 IFBA=634THENIFB$(LL,J)=LC$(P)THEN
X(SI)=LL:Y(SI)=J:SI=SI+1
11525 IFBA=784THENIFB$(LL,J)=LH$(P)THEN
X(SI)=LL:Y(SI)=J:SI=SI+1
11530 NEXT J,LL:RETURN
11600 GOSUB11800:Y=Y+1:GOSUB11700
11630 IFAN$="N"THENGOSUB12600
11640 Y=Y+2
11645 IFY>20GOTO11670
11650 IF AN$="N"THENGOSUB11700:IFAN$="N
"THENGOSUB12600
11670 X=X+1:Y=Y+1:GOSUB11100:IFAN$="Y
"THENGOSUB12600
11680 X=X+1:Y=Y+1:GOSUB11100:IFAN$="Y
"THENGOSUB12600
11695 RETURN
11700 AN$="N":IFX<1ORX>8ORY<1ORY>8THENR
ETURN
11730 FORI=1TO6:IFLC$(I)=B$(X,Y)ORLH$(E
)=B$(X,Y)THENAN$="Y"
11740 NEXT:RETURN
11800 XT=X:YT=Y:RETURN
11900 GOSUB11800:X=XT-1:Y=YT+2:GOSUB119
80
11920 X=XT-2:Y=YT+1:GOSUB11980
11930 X=XT-2:Y=YT-1:GOSUB11980
11940 X=XT-1:Y=YT-2:GOSUB11980
11950 X=XT+1:GOSUB11980
11960 X=XT+2:Y=YT-1:GOSUB11980
11970 X=XT+2:Y=YT+1:GOSUB11980:X=XT+1:Y
=YT+2:GOSUB11980:RETURN
11980 GOSUB11200:GOSUB12100:RETURN
12000 IFAN$="Y"THENGOSUB12600
12010 RETURN
12030 IFAN$="Y"THENGOSUB12600:E=8:GOTO1
2050
12100 IFAN$="N"THENGOSUB12600
12110 RETURN
12200 GOSUB11800:Y=Y+1:GOSUB11980
12210 Y=YT-1:GOSUB11980
12220 X=XT-1:Y=YT:GOSUB11980
12230 X=XT+1:GOSUB11980
12240 X=XT-1:Y=YT+1:GOSUB11980
12250 X=XT+1:GOSUB11980
12260 X=XT-1:Y=YT-1:GOSUB11980
12270 X=XT+1:GOSUB11980:RETURN
12300 GOSUB11800:FORP=1TO7:Y=YT+P:X=XT:
GOSUB11200
12310 IFAN$="Y"THENP=9:GOTO12330
12320 GOSUB11100:IFAN$="N"GOTO12325
12321 F=9
```



```

12325 GOSUB10600
12330 NEXT
12360 FORF=1707: Y=YT-F: X=XT: GOSUB11200
12370 IFAN$="Y" THENF=9: GOTO12410
12380 GOSUB11100: IFAN$="N" GOTO12400
12391 F=9
12400 GOSUB10600
12410 NEXT
12430 FORF=1707: X=XT+F: Y=YT: GOSUB11200
12440 IFAN$="Y" THENF=9: GOTO 12480
12450 GOSUB11100: IFAN$="N" GOTO12470
12460 F=9
12470 GOSUB10600
12480 NEXT
12500 FORF=1707: X=XT-F: Y=YT: GOSUB11200
12510 IFAN$="Y" THENF=9: GOTO12550
12520 GOSUB11100: IFAN$="N" GOTO12540
12530 F=9
12540 GOSUB10600
12550 NEXT
12560 RETURN
12600 GOSUB11800: FORF=1707: X=XT-F: Y=YT+
F: GOSUB11200
12610 IFAN$="Y" THENF=8: GOTO12635
12620 GOSUB11100: IFAN$="Y" THENF=8
12630 GOSUB10600
12635 NEXT
12640 FORF=1707: X=XT+F: Y=YT-F: GOSUB1120
0
12650 IFAN$="Y" THENF=8: GOTO12680
12660 GOSUB11100: IFAN$="Y" THENF=8
12670 GOSUB10600
12680 NEXT
12690 FORF=1707: X=XT+F: Y=YT+F: GOSUB1120
0
12700 IFAN$="Y" THENF=8: GOTO12730
12710 GOSUB11100: IFAN$="Y" THENF=8
12720 GOSUB10600
12730 NEXT
12740 FORF=1707: X=XT-F: Y=YT-F: GOSUB1120
0
12750 IFAN$="Y" THENF=8: GOTO12780
12760 GOSUB11100: IFAN$="Y" THENF=8
12770 GOSUB10600
12780 NEXT
12790 RETURN
12800 FORQ=1706: P=Q: GOSUB11500
12810 IFI=1 GOTO12867
12820 FORM=1705: X=X(MM): Y=Y(MM)
12830 IFQ=2 THENGOSUB12300: X=X(MM): Y=Y(
MM): GOSUB12600: GOTO12860
12831 IFB=784ANDQ=6 THENGOSUB13800: GOTO12860
12850 ONGOSUB12200, 0, 12300, 12600, 1190
0, 11600
12860 NEXTMM
12867 NEXTQ
12870 RETURN
13000 GOSUB11800: Y=Y-1: GOSUB11700: GOSUB
12100
13010 IFY<0 GOTO13030
13020 IFAN$="N" THENY=YT-2: GOSUB11700: GOSUB12100
13030 X=XT+1: Y=YT-1: GOSUB11100: GOSUB120
00
13040 X=XT-1: GOSUB11100: GOSUB12000
13050 RETURN
13300 GOSUB10300: PRINT: PRINT"ENTER YOUR
MOVE: "; INPUT#1, A$, B$, C$, D$
13330 IF A$="" OR B$="" OR C$="" OR D$="" GOTO1
3300
13340 IFASC(A$)<65ORASC(C$)<65ORASC(B$)
<49ORASC(D$)<49 GOTO13300
13350 IFASC(A$)>72ORASC(C$)>72ORASC(B$)
>57ORASC(D$)>57 GOTO13300
13360 XI=ASC(A$)-64: YI=ASC(B$)-48: X5=AS
C(C$)-64: Y5=ASC(D$)-48: RETURN
13400 MI=0: FI=0: P=1: GOSUB11500: X=X(1):
Y=Y(1): FORI=1708: FORJ=1708
13402 ONIGOSUB13406, 13407, 13408, 13409, 1
3410, 13411, 13412, 13413
13403 IFAN$="Y" OR A$="Y" THENFI=1: J=9
13404 ST$=AN$: GOSUB11700: IFAN$="Y" THENJ
=9: AN$=ST$

```

```

13405 NEXT: NEXT: GOTO13420
13406 X=XK: Y=YK+J: GOSUB13414: RETURN
13407 X=XK+J: Y=YK: GOSUB13414: RETURN
13408 X=XK: Y=YK-J: GOSUB13414: RETURN
13409 X=XK-J: Y=YK: GOSUB13414: RETURN
13410 X=XK+J: Y=YK+J: GOSUB13417: RETURN
13411 X=XK+J: Y=YK-J: GOSUB13417: RETURN
13412 X=XK-J: Y=YK+J: GOSUB13417: RETURN
13413 X=XK-J: Y=YK-J: GOSUB13417: RETURN
13414 P=2: GOSUB13800: A$=AN$: P=3: GOSUB13
800
13415 IFJ=1 THENP=1: AF$=AN$: GOSUB13800: I
FAN$="N" THENAN$=AF$
13416 RETURN
13417 P=2: GOSUB13800: A$=AN$: P=4: GOSUB13
800
13418 IFJ=1 THENP=1: AF$=AN$: GOSUB13800: I
FAN$="N" THENAN$=AF$
13419 RETURN
13420 X=XK: Y=YK: MI=0: SI=1: GOSUB11500: SI
=0: IFMI=0 GOTO13445
13425 FORZ=0TOMI-1: AN=PEEK(93+Z): X=FN
X(AN): Y=FN(AN): P=5: GOSUB25000
13430 NEXT: IFPA=1 THENAN$="Y": RETURN
13445 IFB=784GOTO13500
13450 IFX+1>80VX+1>80GOTO13470
13460 IFB(XK+1, YK+1)=LH$(6) THENAN$="Y"
: RETURN
13470 IFX-1<0VX-1<0 THENRETURN
13480 IFB(XK-1, YK+1)=LH$(6) THENAN$="Y"
13490 RETURN
13500 IFX-1<0VX-1<0GOTO13520
13510 IFB(XK-1, YK-1)=LH$(6) THENAN$="Y"
: RETURN
13520 IFX+1>80VX-1<0 THENRETURN
13530 IFB(XK+1, YK-1)=LH$(6) THENAN$="Y"
13540 RETURN
13800 AN$="N": IFX(10VX)>80VX(10VY)>80 THENR
ETURN
13810 IFB=634ANDB$(X, Y)=LH$(P) THENAN$=
"Y": RETURN
13820 IFB=784ANDB$(X, Y)=LH$(P) THENAN$=
"Y"
13830 RETURN
13900 B$(X, Y)=B$(X, Y): B$(X, Y)=E$
: RETURN
14000 BA=634: P=6: GOSUB11500: FORI=1705I-
1: IFY(E)=8 THENB$(X(E), Y(E))=LH$(2)
14010 NEXT
14030 BA=784: P=6: GOSUB11500: D=0: FORI=17
05I-1: IFY(E)=1 THEND=E: E=SI
14040 NEXT: IFD=0 THENRETURN
14050 GOSUB10300: PRINT"YOUR PAWN AT LOC
ATION: ";
14051 PRINTCHR$(64+X(D))", "Y(D)"HAS RE
ACHEDTHE END OF THE BOARD."
14053 PRINT"PRESS 1-FOR A KNIGHT": PRINT
"PRESS 2-FOR A QUEEN"
14080 GETA$: IF A$="" GOTO14080
14081 IFVAL(A$)<1ANDVAL(A$)>2GOTO14080
1
14082 IFVAL(A$)=1 THEN B$(X(D), Y(D))=LH$
(5)
14083 IFVAL(A$)=2 THENB$(X(D), Y(D))=LH$(
2)
14084 RETURN
15000 GOSUB10300: PRINT: PRINT"YOU WIN!":
PRINT: PRINT"PLAY ANOTHER GAME(Y/N)?"
15010 INPUT#1, A$: IF A$="" OR A$<"N" AND A$
>"Y" GOTO15000
15030 IF A$="Y" THENCLR: GOTO10
15040 END
16000 X=FN(PEEK(BA+Z)): Y=FN(PEEK(BA+Z
)): XD=FN(PEEK(BA+75+Z)): YD=FN(PEEK(BA+
75+Z)): RETURN
17000 T=TI: PRINT"ILLEGAL MOVE"
17010 IF(TI-T)<220GOTO17010
17020 GOTO540
25000 P=5: GOSUB13800: IFAN$="Y" THENFI=1:
Z=MI
25010 RETURN
60000 DATA"BK ", "BQ ", "BR ", "BB ", "BKT"
, "BP ", "WK ", "WQ ", "WR ", "WB ", "WKT", "WP
"
READY.

```

All this chess
program needs
to make it a
grandmaster
are some good
subroutines!
Any
suggestions?

COMPUTER

ENTER YOUR MOVE: D, 5, E, 4
\$

OPPONENT

	8	BR	BKT	BB	BK	BQ	BB	BKT	BR
7	.	BP	BP	.	.	BP	BP	.	.
6
5	BP	.	.	.	BP	.	.	BP	.
4	.	.	WP	WP	BP	WP	.	.	.
3	WKT	.	.
2	WP	WP	WP	WP	.
1	WR	WKT	WB	WK	WQ	WB	.	WR	.
	A	B	C	D	E	F	G	H	

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Calculator Accounting

BY MARLIN SNOW

The current crop of personal microcomputers on the market can be programmed to do practical tasks such as accounting applications as well as a myriad of games like chess, checkers, etc. These microcomputers, with a printing peripheral, usually begin at a cost of \$1000 and soar upwards. If you are a businessman or an accountant who does not want to spend that much for a microcomputer (and you don't have a lot of time to devote learning BASIC language or complicated operating instructions for the unit) consider the TI59 programmable calculator. The TI59 with a PC-100C printer lists at only \$500. By shopping around you may even be able to get one for \$425.

The disadvantage of the TI59 compared to a microcomputer is its limited alpha capability and storage capability. Twenty alpha characters can be printed on each line by the TI59. This permits the heading of tapes and labeling of figures. A printed character is represented by a two-digit code; for instance, the word "INCOME" is printed by keying in 243115323017 2nd OP 03.

I N C O M E
24 31 15 32 30 17

Alpha and numeric characters can be printed anywhere on the tape. Characters are printed at the rate of 60 characters/second. If printing instructions are included in your program it decreases the number of registers left for the program and storage of data. Microcomputers have considerably more storage capacity.

A general ledger system is not always dependent upon microcomputers with sophisticated alpha capabilities to do ordinary bookkeeping tasks. The only requirement is a chart of accounts numbered to correspond to the calculator's memories. You don't need more than the TI59's capacity to handle an average set of books in either the single or double entry method. You can carry 100 accounts if you do not include a program to verify that debits equal credits. If you want to include a program that will add all of the registers to prove posting and/or get a total of portions of the accounts, the maximum number of accounts the TI59 can handle will be 80. But this will be adequate for the average company.

The memory storage area is divided between program and data storage as follows:

	Program	Data
BANK	Locations	Locations
1	00-239	90-99
2	240-479	60-89
3	480-719	30-59
4	720-959	00-29

Note that program steps start at Bank 1 and go into Bank 2. Data registers start in Bank 4 and go into Bank 3. The Banks refer to positions on the magnetic card. In order to record all data and program memories in the calculator, you would need to record all 4 banks. This requires two magnetic cards with two banks on each card, (one bank on the left side, one

on the right side). If a program ends at location 215 and the memory registers are full from 00 to 29, you would record Bank 1 and Bank 4 on the magnetic card if you wanted to preserve the data for future use.

Following is a demonstration program to handle a set of books on the TI59 for a small company:

STEP #1:

Prepare a chart of accounts. Number the chart from 00 to 79, or 00 to 69, depending on your needs. Remember, the maximum number of accounts with a program to add the accounts is 80. This illustration uses a 70-account chart, reserving the first 30 memories for the balance sheet and the remaining 40 memories for profit and loss accounts. Note that almost half of the memories are blank. Additional accounts can be inserted in these blanks as the need arises. All amounts are in whole dollars for the writer's convenience. The ABC Co. uses the accrual method of accounting.

A/C #	Account	Opening Balances	A/C #	Account
00	Checking account	12,000	30	Sales
01			31	Sales Returns
02	Savings account	15,000	32	Interest Income
03	Accounts Receivable		33	
04	Notes Receivable	2,500	34	Purchases
05	Inventory	5,000	35	Inventory Change
06	Land	150,000	36	Plant Wages
07	Buildings	300,000	37	
08	Accumulated Depreciation	-75,000	38	Office Salaries
09	Furniture & Fixtures	5,500	39	
10	Accumulated Depreciation	-1,500	40	Payroll Taxes
11	Machinery & Equipment	42,500	41	
12	Accumulated Depreciation	-11,000	42	Delivery Expense
13	Delivery Equipment	25,000	43	
14	Accumulated Depreciation	-5,000	44	Office Supplies
15			45	
16			46	Utilities
17	Accounts Payable	-5,000	47	
18	Notes Payable	-50,000	48	Phone
19			49	
20	Payroll Taxes Payable	-2,234	50	Professional Fees
21			51	
22	Mortgage Payable	-111,566	52	Uniforms
23			53	
24			54	Advertising
25			55	
26			56	Interest
27	Net Worth	-296,200	57	
28	Drawing		58	Depreciation
29	Net Profit	-0-	59	
			60	Promotion
			61	
			62	Commissions
			63	
			64	Repairs
			65	
			66	Insurance
			67	
			68	
			69	Bad Checks

STEP #2:

Enter the program to add memories 00 to 69 into the calculator (to verify that debits equal credits) and include in that program a means of determining what the net profit is at any time. This is also necessary to close net profit to account 29 when the P&L accounts are closed at the end of the year.

Attach the TI59 to the printer. Turn printer and calculator on. The calculator is automatically partitioned for 480 program steps and 60 memories when it is turned on. Since you are going to use 70 memories to store data, you will have to change this partition to accommodate 70 memories. This is done by pressing the following keys: 7 2nd OP 17. The display shows 399.69. This means that there are now available 400 program steps and 70 memories. This program takes only 214 steps, so there are 186 steps available to add any other group of accounts you desire. Each memory is recalled and added to the next memory until the 70th memory is reached.

The program works as follows: Press LRN — the display reads 000 00. The first 3 digits are program locations and the last two are key numbers.

Program Location	Key No.	Key Symbol	Comments
000	76	LBL	Insert label A
001	11	A	
002	43	RCL	Recall
003	00	00	Memory 00
004	85	+	Add to
005	43	RCL	Recall
006	01	01	Memory 01
007	85	+	Plus
008	43	RCL	Recall
009	02	02	Memory 02
010	85	+	Plus
011	43	RCL	Recall
012	03	03	Memory 03
013	85	+	Plus

086	43	RCL	
087	28	28	
088	85	+	
089	43	RCL	
090	29	29	End of balance sheet
091	85	+	
092	76	LBL	Insert label B
093	12	B	
094	43	RCL	
095	30	30	Begin P&L accounts
096	85	+	
097	43	RCL	
098	31	31	
099	85	+	

205	43	RCL	
206	67	67	
207	85	+	
208	43	RCL	
209	68	68	
210	85	+	
211	43	RCL	
212	69	69	
213	95	=	End of program
214	91	R/S	Stop program, Press LRN to exit program.

The function of labels:

LABEL A: When this key is pressed, it adds up all memories (00-69) and shows the sum in the display after memory 69 is reached. If a zero is displayed, debits equal credits. If other than zero, the amount of error is shown.

LABEL B: When this key is pressed, memories 30 thru 69 are added and the sum displayed. The figure in the display is the net profit for ABC Co. The sum at any memory location could be printed by a PRT command inserted after the pointer has passed that location. It is not done here, as you can see.

The complete program is shown on the tape below:

Program Listing

000	76	LBL	073	85	+	145	43	RCL
001	11	A	074	43	RCL	146	47	47
002	43	RCL	075	24	24	147	85	+
003	00	00	076	85	+	148	43	RCL
004	85	+	077	43	RCL	149	48	48
005	43	RCL	078	25	25	150	85	+
006	01	01	079	85	+	151	43	RCL
007	85	+	080	43	RCL	152	49	49
008	43	RCL	081	26	26	153	85	+
009	02	02	082	85	+	154	43	RCL
010	85	+	083	43	RCL	155	50	50
011	43	RCL	084	27	27	156	85	+
012	03	03	085	85	+	157	43	RCL
013	85	+	086	43	RCL	158	51	51
014	43	RCL	087	28	28	159	85	+
015	04	04	088	85	+	160	43	RCL
016	85	+	089	43	RCL	161	52	52
017	43	RCL	090	29	29	162	85	+
018	05	05	091	85	+	163	43	RCL
019	85	+	092	76	LBL	164	53	53
020	43	RCL	093	12	B	165	85	+
021	06	06	094	43	RCL	166	43	RCL
022	85	+	095	30	30	167	54	54
023	43	RCL	096	85	+	168	85	+
024	07	07	097	43	RCL	169	43	RCL
025	85	+	098	31	31	170	55	55
026	43	RCL	099	85	+	171	85	+
027	08	08	100	43	RCL	172	43	RCL
028	85	+	101	32	32	173	56	56
030	09	9	102	85	+	174	85	+
031	85	+	103	43	RCL	175	43	RCL
032	43	RCL	104	33	33	176	57	57
033	10	10	105	85	+	177	85	+
034	85	+	106	43	RCL	178	43	RCL
035	43	RCL	107	34	34	179	58	58
036	11	11	108	85	+	180	85	+
037	85	+	109	43	RCL	181	43	RCL
038	43	RCL	110	35	35	182	59	59
039	12	12	111	85	+	183	85	+
040	85	+	112	43	RCL	184	43	RCL
041	43	RCL	113	36	36	185	60	60
042	13	13	114	85	+	186	85	+
043	85	+	115	43	RCL	187	43	RCL
044	43	RCL	116	37	37	188	61	61
045	14	14	117	85	+	189	85	+
046	85	+	118	43	RCL	190	43	RCL
047	43	RCL	119	38	38	191	62	62
048	15	15	120	85	+	192	85	+
049	85	+	121	43	RCL	193	43	RCL
050	43	RCL	122	39	39	194	63	63
051	16	16	123	85	+	195	85	+
052	85	+	124	43	RCL	196	43	RCL
053	43	RCL	125	40	40	197	64	64
054	17	17	126	85	+	198	85	+
055	85	+	127	43	RCL	199	43	RCL
056	43	RCL	128	41	41	200	65	65
057	18	18	129	85	+	201	85	+
058	85	+	130	43	RCL	202	43	RCL
059	43	RCL	131	42	42	203	66	66
060	19	19	132	85	+	204	85	+
061	85	+	133	43	RCL	205	43	RCL
062	43	RCL	134	43	43	206	67	67
063	20	20	135	85	+	207	85	+
064	85	+	136	43	RCL	208	43	RCL
065	43	RCL	137	44	44	209	68	68
066	21	21	138	85	+	210	85	+
067	85	+	139	43	RCL	211	43	RCL
068	43	RCL	140	45	45	212	69	69
069	22	22	141	85	+	213	95	=
070	85	+	142	43	RCL	214	91	R/S
071	43	RCL	143	46	46	215	00	0
072	23	23	144	85	+			

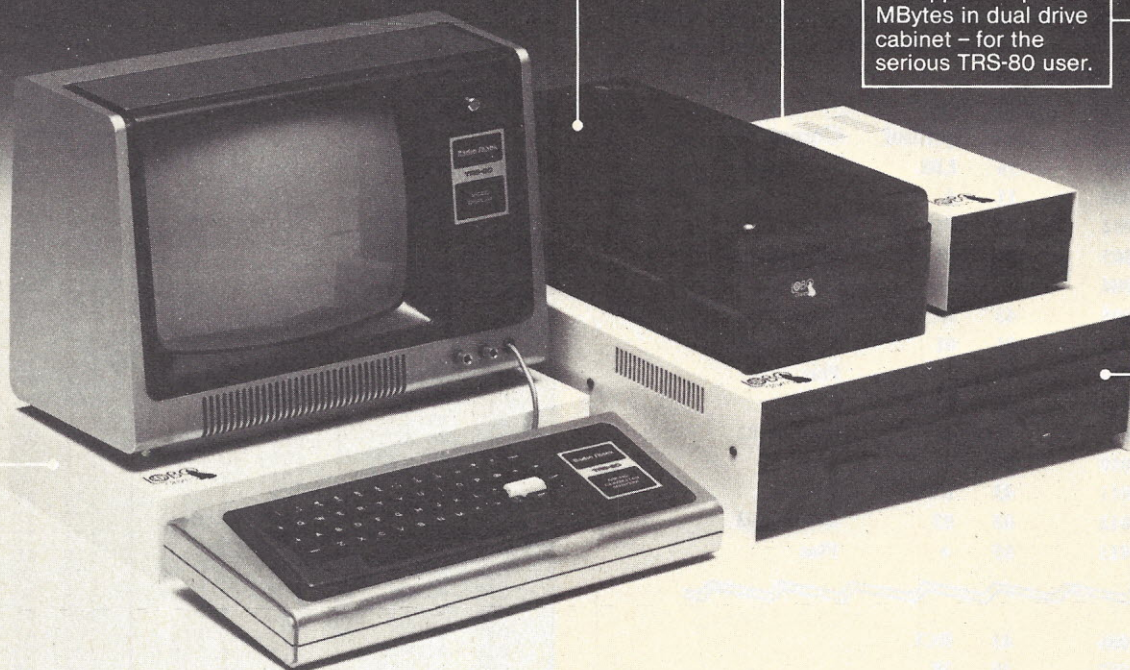
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| <input type="checkbox"/> 8-in. Floppy drive
Single sided
Double sided | <input type="checkbox"/> Double density
expansion interface |

Name

Company

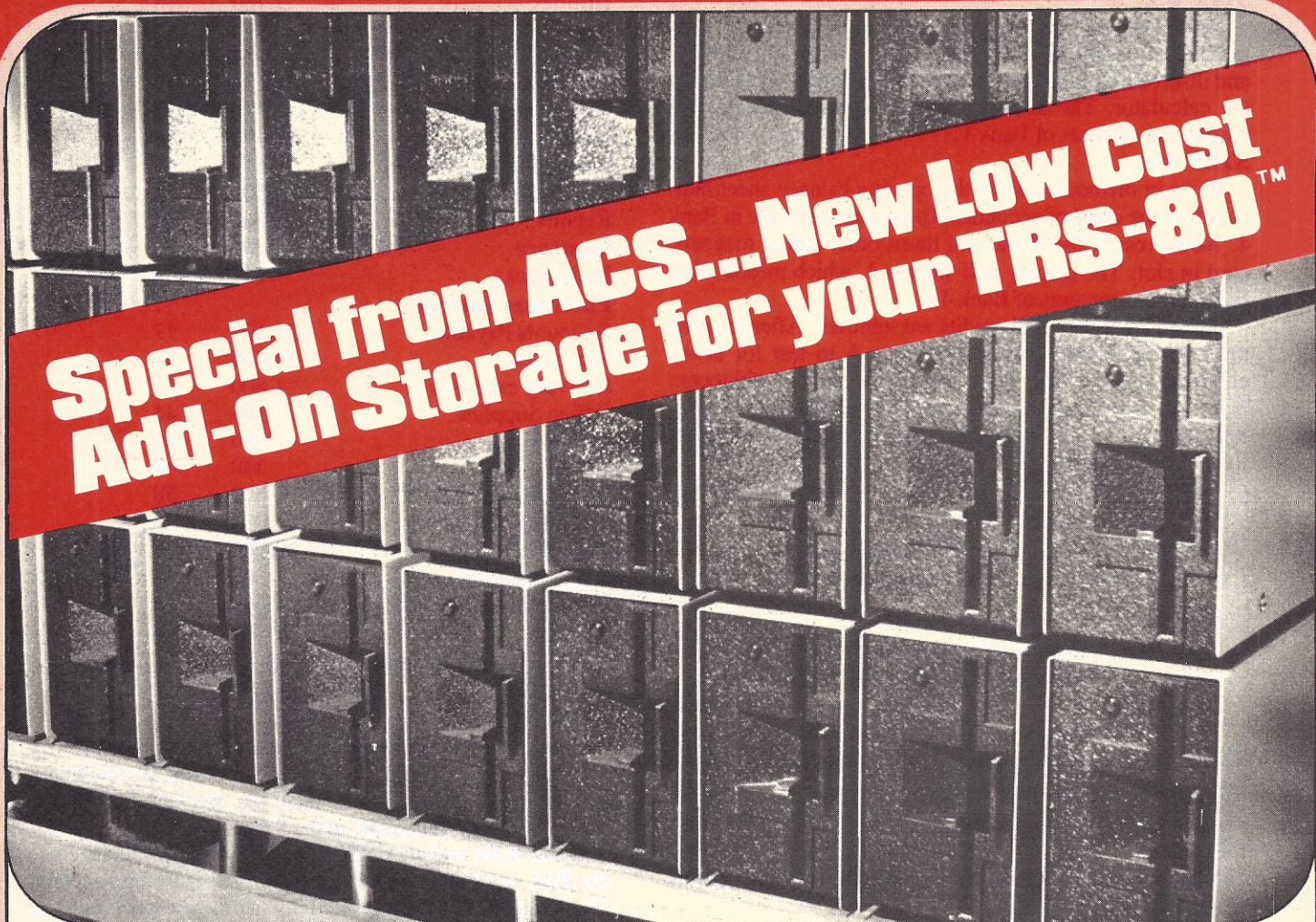
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STEP #3:

Record the program on a magnetic card. Remember, program locations 00-29 are stored in Bank 1. Press: 1 2nd Write and insert a magnetic card through the slot on the right side of the calculator. The display shows a 1, which means it recorded the contents of Bank 1.

STEP #4:

Enter in memories 00-29 the opening balance sheet indicated on the chart of accounts. These memories are in Bank 4. Now press 4 2nd Write and insert other end of magnetic card in slot. The display will show a 4, which means it has recorded the contents of Bank 4.

Debits are pluses and credits are minuses. After entering the opening balance sheet, press key A to test for debits equalling credits. The TI59 uses direct register arithmetic. You can add, subtract, multiply, and divide the display register value with any data register. The display register itself is not changed.

SUM XX — Memory Sum —

Adds the display register value to the contents of data register XX and stores the result in XX.

INV SUM XX — Memory Subtract —

Subtracts the display register value from the contents of data register XX and stores the result in XX.

These capabilities eliminate the lengthy recall, perform operations, store-again sequences.

STEP #5:

Key into the calculator the summaries from the various journals:

Account Description	Amount	Account/ Memory
Sales & Cash Receipts		
Sales	-195,000	30
Sales Returns	5,000	31
Notes Receivable	-500	04
Interest Income	-850	32
Savings deposits	750	02
Checking deposits	175,600	00
Accounts Receivable	15,000	03
Journal Entries:		
Depreciation expense	20,150	58
Accumulated Depreciation:		
Buildings	-12,000	08
Furniture & Fixtures	-550	10
Machinery & Equip.	-5,100	12
Delivery Equipment	-2,500	14
Payroll Taxes Expense	5,500	40
Payroll Taxes Accrued	-5,500	20
Inventory	760	05
Inventory Change	-760	35
Cash Disbursements		
Checking account	-112,694	00
Notes Payable	5,000	18
Payroll Taxes Payable	2,234	20
Mortgage Payable	10,000	22
Drawing	2,500	28
Purchases	60,000	34
Payroll Taxes expense	3,600	40
Delivery expense	3,750	42
Office Supplies	550	44

Utilities	3,760	46
Phone	999	48
Professional Fees	750	50
Uniforms	120	52
Advertising	110	54
Interest expense	14,490	56
Promotion	511	60
Commissions	1,500	62
Repairs	666	64
Insurance	2,000	66
Bad Checks	154	69

Purchases Journal

Accounts Payable	-31,500	17
Purchases	25,400	34
Delivery expenses	4,800	42
Office Supplies	100	44
Utilities	560	46
Phone	340	48
Professional Fees	300	50

Payroll Journal

Plant Wages	30,000	36
Office Salaries	7,500	38
Payroll Taxes Payable	-5,600	20
Checking	-31,900	00

After each journal has been entered into the calculator, press key A to check accuracy of posting.

STEP #6:

Since all of the journals are posted, you are now in a position to determine the net profits. Press key B. The figure -4,000 appears. This means ABC Co. has a profit of 4,000 since credits exceed debits in the P&L section.

If this is the end of ABC Co.'s year, you will want to close the P&L accounts and put the net profit figure into account 29. Closing is accomplished by storing a zero into all memories from 30 to 69 and putting -4,000 in account 29.

But, first, print out all the accounts so you can preserve the tape for a permanent record.

Press: INV 2nd LIST

A trial balance tape is produced:

43006.	00	-760.	35
0.	01	30000.	36
15750.	02	0.	37
15000.	03	7500.	38
2000.	04	0.	39
5760.	05	9100.	40
150000.	06	0.	41
300000.	07	8550.	42
-87000.	08	0.	43
5500.	09	650.	44
-2050.	10	0.	45
42500.	11	4320.	46
-16100.	12	0.	47
25000.	13	1339.	48
-7500.	14	0.	49
0.	15	1050.	50
0.	16	0.	51
-36500.	17	120.	52
-45000.	18	0.	53
0.	19	110.	54
-11100.	20	0.	55
0.	21	14490.	56
-101566.	22	0.	57
0.	23	20150.	58
0.	24	0.	59
0.	25	511.	60
0.	26	0.	61
-296200.	27	1500.	62
2500.	28	0.	63
0.	29	666.	64
-195000.	30	0.	65
5000.	31	2000.	66
-850.	32	0.	67
0.	33	0.	68
85400.	34	154.	69

Next, close out the P&L accounts by storing a zero into all memories from 30 to 69 and put -4,000 in memory 29. Run another tape by pressing INV 2nd List. This tape prints only the balance sheet section (the P&L accounts now showing zeros) as illustrated in the box to the right.

Magnetic cards retain records for following months

Record the ending balance sheet on a magnetic card, Bank 4. Remember, Bank 1 containing the program is still on a magnetic card and Bank 4 is on the same card with the opening balance sheet. Use this same magnetic card and record the new balance sheet on Bank 4. The new balance sheet is recorded over the old one, and the program to add the accounts is still on Bank 1 of the magnetic card. You are now ready to start a new year (after you close net profit to net worth).

If this is only the first month's activity of this year for the ABC Co., you don't want to close out the P&L accounts, but rather add the next month's activity to this one. Therefore, it will be necessary to record Banks 2, 3, and 4 to get all data on magnetic cards.

To record Bank 2, press:

2 2nd Write and insert an unused magnetic card into slot

To record Bank 3, press:

3 2nd Write and insert the same magnetic card into slot

To record Bank 4, press:

4 2nd Write and insert the original side of 4 of the magnetic card you started out with.

A month goes by and the calculator has been off all this time. To set up the calculator for next month's recording, read magnetic cards into calculator by pressing:

1 INV 2nd Write, then put card into slot

2 INV 2nd Write, then put card into slot

3 INV 2nd Write, then put card into slot

4 INV 2nd Write, then put card into slot

Then proceed with step #5 above.

This program will work best in conjunction with pegboard systems but can be used with any system. Remember to keep all source documents filed away by month so that if IRS audits you, you

will be prepared. Always have a tape made for the beginning and end of each accounting period. □

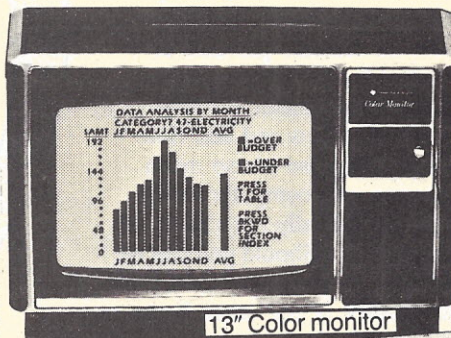
(Part II, "Programming Tax Tables" will appear next month.)

43006.	00	0.	35
0.	01	0.	36
15750.	02	0.	37
15000.	03	0.	38
2000.	04	0.	39
5760.	05	0.	40
150000.	06	0.	41
300000.	07	0.	42
-87000.	08	0.	43
5500.	09	0.	44
-2050.	10	0.	45
42500.	11	0.	46
-16100.	12	0.	47
25000.	13	0.	48
-7500.	14	0.	49
0.	15	0.	50
0.	16	0.	51
-36500.	17	0.	52
-45000.	18	0.	53
0.	19	0.	54
-11100.	20	0.	55
0.	21	0.	56
-101566.	22	0.	57
0.	23	0.	58
0.	24	0.	59
0.	25	0.	60
0.	26	0.	61
-296200.	27	0.	62
2500.	28	0.	63
-4000.	29	0.	64
0.	30	0.	65
0.	31	0.	66
0.	32	0.	67
0.	33	0.	68
0.	34	0.	69

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220 cal

1000 cal

BY LISA AND GARY
RENSBERGER

Counting calories with a table can be frustrating and time-consuming. This calorie calculating program, along with a list of your daily food intake, will keep an record of calories consumed.

Using this program to convert food quantities to their caloric equivalents is faster and more accurate than using a published table and pocket calculator. For instance, let's say for breakfast you had 3 ounces of cereal, 2 cups of milk and 1-1/2 slices of toast with butter and jelly. The computer multiplies the number of calories per unit of measurement (ounce, cup or piece) of each food item and adds them up. Performing this task manually involves searching for each item in a table, noting the type of unit specified in the table, and then multiplying the number of calories per unit or fractions of a unit of each of the food items. In the breakfast example, you must search for five items, perform five multiplications and add five items, a pretty dull chore. Because it's so much faster and actually fun using your computer for the task, you are more apt to periodically run a check of your daily caloric consumption. (Should you like the speed and compactness of this program, we'll show you later on how to modify it for other home or business inventory calculations.)

After every meal list each food item and the quantity eaten (use units, tbsp, ounces, cups, pieces, slices or strips). Then type the program into your computer. Lines 1000 to 2000 contain the food data. Each line contains a food item along with a code for the type of measurement and the number of calories per type of measurement. Codes for food measurements are: 1=units, 2=tbsp, 3=ounces, 4=cups, 5=pieces, 6=slices, 7=strips. As an example, look at line 1000. It reads: "DATA APPLE,1,188", which translates as "units". The number "188" represents the number of calories per unit apple. You may add any food items you use that aren't on the food data list by using one of the seven codes.

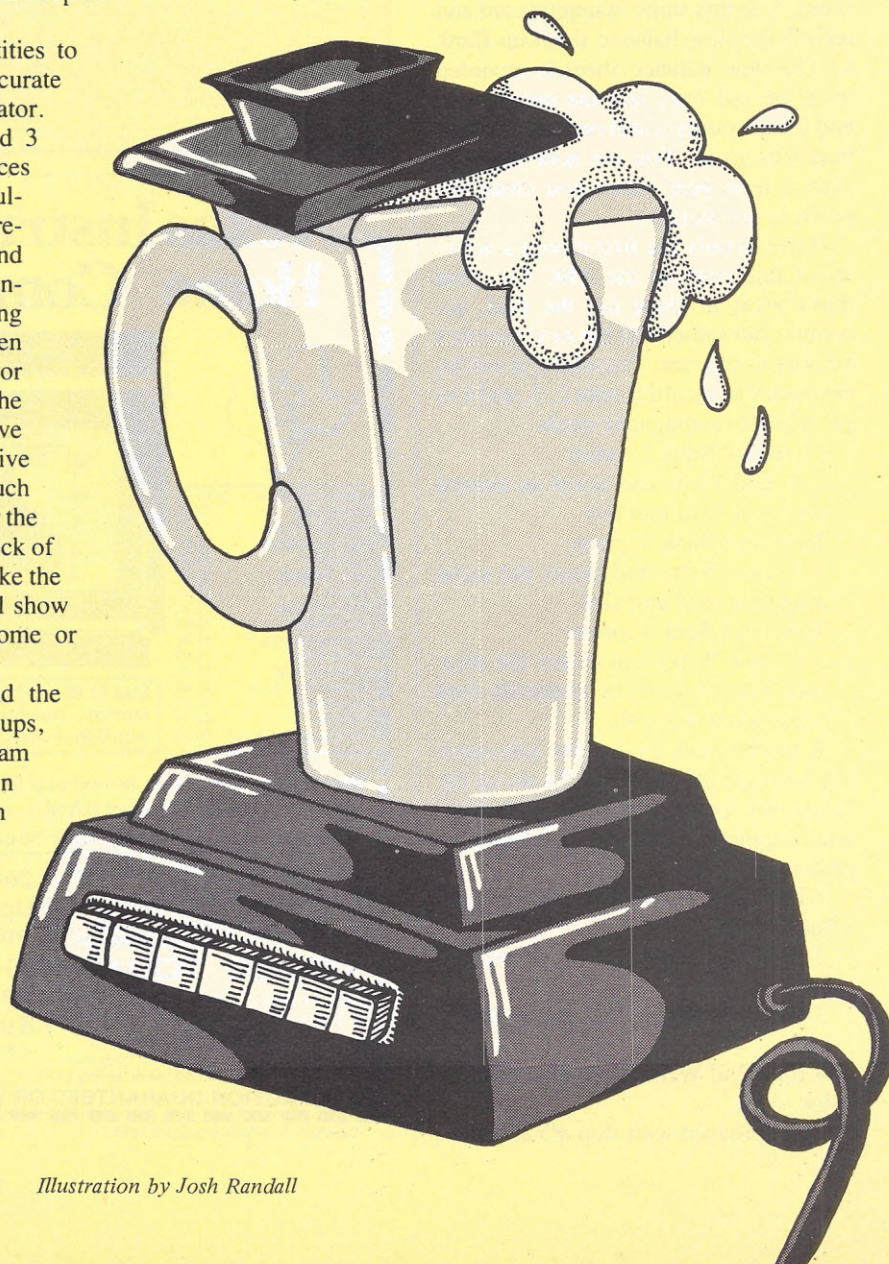


Illustration by Josh Randall

69,000 CAL 8,000 CAL 430 CAL

When you begin the program, "ITEM" will appear on the screen. Type in a food item, followed by "return". When the computer asks, "HOW MANY?", type the decimal number of the food measurement. For example, if you used 2 ounces of cereal, when the computer asks, "HOW MANY OUNCES?", enter "2". The next item will be requested, and so on until all the items have been entered. After you type in "END", the computer prints out a list of the quantities and calories for each food item, followed by the total caloric equivalent of the list. The computer's response when you misspell a food item or specify an undefined item is shown in the sample run.

In the sample run, I input the first food item of the list. When the request for a quantity appeared, I entered just the numerical amount. This process continues unless you misspell a food item or input a name not on the food data list. In this sample run, the computer printed all of the food items on the list starting with the same first letter as my erroneous input. When there were no further food items to be entered, I typed "END". The computer then printed out each food item, adding "s" when the number of units is greater than 1, with the quantity preceding it and the number of calories following it. The total is the last number printed below the dashed line.

This program runs on the Kim module with Microsoft BASIC, and is compatible with Pet BASIC and TRS-80 Level II BASIC. With the food data given, the program requires only 4K of user memory. If you've greatly expanded the data list and you're limited in memory, you may revise the program so that it can store the food data on disk. You'll need to read the data into an array and store the array on disk.

To make a food item plural, the program currently adds an "s". If some plural forms of your food items require an "es", as in potato(es), it will be necessary to add a fourth number to the

data statements containing a code 1. This additional number could be a "1" or "2" to make a unit food item plural with an "s" or "es" respectively. Only slight changes to the program would be necessary.

The fundamental operations of this program, that is, inputting a list of items, searching a table for the items, retrieving and outputting associated data (in the previous examples, calories and units of measurements), and performing calculations on the retrieved data, are applicable to a range of activities. For example, a merchandise in-

ventory may be substituted for the food list, with costs replacing calories. The units of food measurement would simply be replaced by such words as "each", "pounds", "sacks", and so forth. Calculations in this application might include multiplication of the cost by a mark-up percentage, perhaps based upon or modified by an added element in the data list. Making such a series of changes only involves modifying lines 510 to 830, and typing in a modified data list. The variety of such alternative applications is limited only by your imagination and needs. □

ITEM? APPLE SAUCE
HOW MANY CUPS? 1

ITEM? COLD CEREAL
HOW MANY OUNCES? 1

ITEM? MILK
HOW MANY CUPS? 1.5

ITEM? TOAST
DON'T HAVE TOAST

TOMATO SOUP
TARTAR SAUCE
TUNA
TURKEY

ITEM? BREAD
HOW MANY PIECES? 2

ITEM? BUTTER
HOW MANY TBSP? 1

ITEM? BACON
HOW MANY STRIPS? 2

ITEM? FRIED EGGS
DON'T HAVE FRIED EGGS

FRIED EGG
FRIED PERCH
FISH STICK
FRUIT COCKTAIL
FRUITCAKE

ITEM? FRIED EGG
HOW MANY? 2

ITEM? END

1	CUP	APPLE SAUCE	230.
1	OUNCE	COLD CEREAL	105
1.5	CUPS	MILK	75
2	PIECES	BREAD	120
1	TBSP	BUTTER	100
2	STRIPS	BACON	100
2		FRIED EGGS	216

946

Sample Run



```

10 REM--CALORIE CALCULATOR
20 REM--WRITTEN BY GARY RENSBERGER
30 REM
40 REM
50 I=0
60 T=0
80 DIM TABLE(50)
90 DIM TABLE$(50,2)
100 PRINT: INPUT "ITEM"; A$: IF A$="END" THEN 300
110 RESTORE
120 READ B$
130 IF B$="END" THEN 180
140 IF B$=A$ THEN 200
150 READ DUMMY, DUMMY
160 GOTO 120
170 REM =====

```

Program Listing



Program Listing continued

171 REM LIST ALL FOODS WITH SAME INITIAL
172 REM LETTER AS TYPED BY USER

173 REM
180 PRINT "DON'T HAVE ";A\$
181 PRINT
182 RESTORE
183 READ T\$, DUMMY, DUMMY
184 IF T\$ = "END" THEN 100
185 IF LEFT\$(A\$,1) = LEFT\$(T\$,1) THEN 190

186 GOTO 183
190 PRINT T\$
195 GOTO 183

200 REM =====
210 READ UNIT

220 ON UNIT GOSUB 500,550,600,650,700,750,800
230 TABLE\$(1,2)=B\$

240 READ CAL
250 TABLE(I)=INT(C*CAL)

260 TABLE\$(I,0)=STR\$(C)
270 I=I+1

280 GOTO 100

300 REM =====

305 REM PRINT TABLE

310 PRINT: FOR J=1 TO 47: PRINT"-";: NEXT J: PRINT

320 FOR N=0 TO I-1

330 PRINT TABLE\$(N,0); TAB(5); TABLE\$(N,1); TAB(15);

340 PRINT TABLE\$(N,2); TAB(40); TABLE(N)

350 T=T+TABLE(N)

360 NEXT N

365 REM ? TOTAL

370 FOR I=1 TO 47: PRINT"-";: NEXT I: PRINT

380 PRINT TAB(40); T

390 END

400 REM =====

500 REM =====
510 INPUT "HOW MANY";C

515 TABLE\$(I,1)=" "

520 IF C>1 THEN B\$=B\$+"S"

530 RETURN

550 REM =====

560 INPUT "HOW MANY TBSP";C

570 TABLE\$(I,1)="TBSP"

580 RETURN

600 REM =====

610 INPUT "HOW MANY OUNCES";C

620 IF C>1 THEN TABLE\$(I,1)="OUNCES"

630 IF C=1 THEN TABLE\$(I,1)="OUNCE"

640 RETURN

650 REM =====

660 INPUT "HOW MANY CUPS";C

670 IF C>1 THEN TABLE\$(I,1)="CUPS"

680 IF C=1 THEN TABLE\$(I,1)="CUP"

690 RETURN

700 REM =====

710 INPUT "HOW MANY PIECES";C

720 IF C>1 THEN TABLE\$(I,1)="PIECES"

730 IF C=1 THEN TABLE\$(I,1)="PIECE"

740 RETURN

750 REM =====

760 INPUT "HOW MANY SLICES";C

770 IF C>1 THEN TABLE\$(I,1)="SLICES"

780 IF C=1 THEN TABLE\$(I,1)="SLICE"

790 RETURN

800 REM =====

810 INPUT "HOW MANY STRIPS";C

820 IF C>1 THEN TABLE\$(I,1)="STRIPS"

830 IF C=1 THEN TABLE\$(I,1)="STRIP"

840 RETURN

997 REM =====

998 REM = FOOD DATA =

999 REM =====

1000 DATA APPLE,1,188

1001 DATA APPLE SAUCE,4,230

1002 DATA ASPARAGUS,5,3

1003 DATA BACON,7,50

1004 DATA BANANA,1,85

1005 DATA PORK AND BEANS,4,320

1006 DATA STRING BEANS,4,30

1007 DATA LIMA BEANS,4,180

1008 DATA HAMBURGER,3,61

1009 DATA ROAST,3,82

1010 DATA STEAK,3,73

1012 DATA BISCUIT,1,140

1013 DATA BERRIES,4,85

1014 DATA BREAD,5,60

1015 DATA BROCCOLI,4,40

1016 DATA BRUSSELS SPROUTS,4,40

1017 DATA BUTTER,2,100

1018 DATA CHOCOLATE CAKE,5,455

1019 DATA CAKE,5,370

1020 DATA CUPCAKE,1,185

1021 DATA SPONGE CAKE,5,120

1022 DATA CARAMEL,3,115

1023 DATA CHOCOLATE,2,150

1024 DATA MINTS,1,87

1025 DATA CANTALOUPE,5,60

1026 DATA CARROTS,4,45

1027 DATA CATSUP,2,15

1028 DATA CAULIFLOWER,4,25

1029 DATA OATMEAL,4,130

1030 DATA COLD CEREAL,3,105

1031 DATA CHEESE,3,105

1032 DATA CHEDDAR CHEESE,3,70

1033 DATA COTTAGE CHEESE,4,240

1034 DATA PARMESIAN CHEESE,2,20

1035 DATA SWISS CHEESE,3,105

1036 DATA CHICKEN DRUMSTICK,1,90

1037 DATA CHICKEN BREAST,1,200

1038 DATA CHICKEN PIE,1,500

1039 DATA CHOCOLATE SYRUP,2,50

1040 DATA COLA,4,95

1041 DATA COOKIE,1,120

1042 DATA CRACKER,1,35

1043 DATA CUSTARD,4,285

1044 DATA FRIED EGG,1,108

1045 DATA FRIED PERCH,3,65

1046 DATA FISH STICK,1,40

1047 DATA FRUIT COCKTAIL,5,115

1048 DATA FRUITCAKE,5,115

1049 DATA JELLO,4,150

1050 DATA HONEY,2,65

1051 DATA ICE CREAM,4,300

1052 DATA JELLY,2,55

1053 DATA LUNCH MEAT,6,75

1054 DATA MACARONI,4,470

1055 DATA SYRUP,2,50

1056 DATA MILK,4,50

1057 DATA NUFFIN,1,140

1058 DATA NOODLES,4,200

1059 DATA ORANGE,1,60

1060 DATA PEACHES,4,100

1061 DATA PEARS,4,100

1062 DATA PICKLES,1,12

1063 DATA PIE,1,300

1064 DATA PIZZA,5,185

1065 DATA PORK CHOP,3,80

1066 DATA SAUSAGE,3,90

1067 DATA POTATO CHIPS,1,11

1068 DATA POTATO,1,90

1069 DATA MASHED POTATO,4,125

1070 DATA PUDDING,4,275

1071 DATA RICE,4,190

1072 DATA ROLL,1,120

1073 DATA SALMON,3,50

1074 DATA SARDINES,3,60

1075 DATA NOODLE SOUP,4,65

1076 DATA CREAM SOUP,4,150

1077 DATA TOMATO SOUP,4,90

1078 DATA SPAGHETTI,4,150

1079 DATA SUGAR,2,45

1080 DATA TARTAR SAUCE,2,95

1081 DATA TUNA,3,60

1082 DATA TURKEY,6,70

1083 DATA PANCAKE,1,60

1084 DATA WAFFLE,1,210

2000 DATA END,1,1

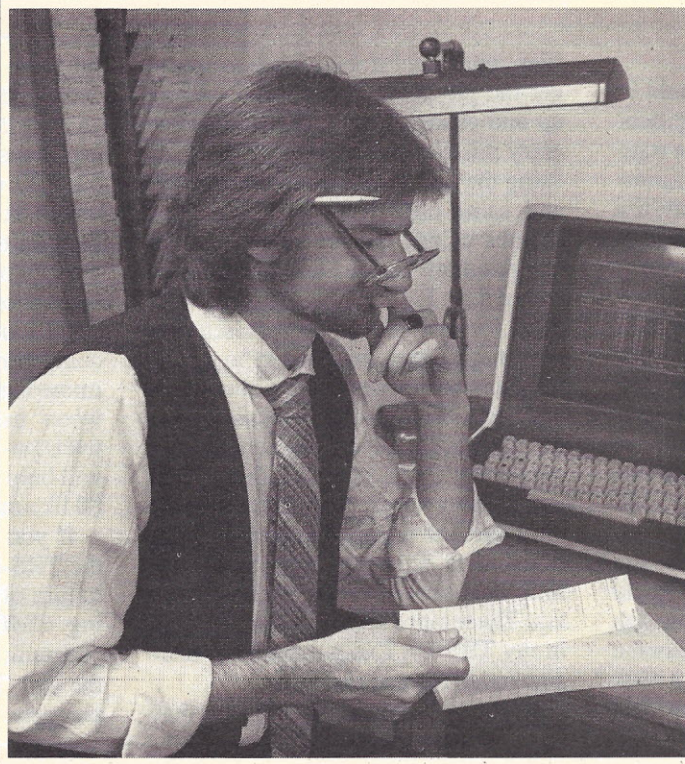
OK

Keeping Tabs on Service Technicians

BY CLINT HENTZ

In managing several small service operations, I've found my TRS-80 helpful in producing valuable operating data. One of my operations is a TV repair service consisting of 48 persons, including 18 service technicians rendering TV and hi-fi service in customer's homes. Therefore, it's important to know who is doing what, where and how. In several instances the data I received from the program pointed out situations which required a review of the practices used by certain technicians. Of course, any service information can be prepared manually with pencil and paper. But the clerical time required to perform these calculations becomes astronomical and costly. And after all, large numbers of calculations and tabulations are what a computer does best.

The program I have listed, which is designed for a TV repair shop, is also applicable to a major appliance repair shop by only changing some of the headings and terminology. In fact, one version of the program, with terminology changes, is being used in an appliance shop which has six technicians rendering air conditioning, refrigeration, washer and dryer service in customers' homes. The program could also benefit "in office" repair operations servicing typewriters, copy machines and ditto equipment. And it could apply to P.O.S. terminal repair companies servicing supermarkets and department stores on the point of sale terminals, the modern computer equiv-



alent of old-time cash registers.

Equipment

The original full length version of the listed program was written for a TRS-80 Level II and Level III with 48K, tape cassette and Centronics tractor feed line printer.

Level III is not used in the listed program, but I use it in my TRS-80 as it does an excellent job of renumbering, including GOTOs and GOSUBs. While the price of about \$50 might seem high for renumbering, Level III does contain

several other useful features, including the ability to define your own functions. If you have a TRS-80, you should check out the G2 Level III.* I feel it does everything the company claimed it would do. However, it does take up 5.25K RAM. On a 16K computer, that doesn't leave much memory to work with.

Program

The program as listed has been condensed from the original for demonstration purposes and contains no surprises. It will work on a TRS-80 Level II with 16K and perform well for you as listed. You'll probably want to revise the program to fit your particular needs. The changes you make should

not require much work as the program is not cluttered with fancy statements. In the section entitled "Hints and Suggestions" I have attempted to clarify the functions which might cause a problem.

The listed program Part 1 takes the service calls the technician makes and breaks them down into specific categories. It then tabulates the data and spells out some observations. Part 2 takes the individual technicians' data prepared in Part 1 and produces a report for com-

*Editor's Note: G2 Level III was originally marketed by GRT Corporation's G2 Division, which is now out of business. However, the software is available from Microsoft, the original developers, under the name Microsoft Level III BASIC. You can buy Level III through your local dealer or directly from Microsoft. Price is \$49.95. Contact Microsoft Consumer Products, 10800 N.E. Eighth, Suite 819, Bellevue, WA 98004; (206) 454-1315.

Each of the observations in Part 1 reveals pertinent information necessary in operating a service company or department. Any one of the nine items covered in the observations is an area needing constant attention and should be considered as an ongoing project for improvement. Also, by tracking service calls with the program, you have a chance to see if any changes you make in procedure or routine have an effect on the department averages. In business, not all changes end up affecting the bottom line of the P and L. The program gives you an easy way to ascertain the effect of the changes.

I wrote the program so it could be easily adapted to other computers. Therefore, there are no multi-line statements, loops or arrays in the program. If your computer will accept multi-line statements, I suggest you study the program and see the individual modules I have used for each section. For example, you could combine lines 200, 210 and 220. Then the next group: 230, 240 and 250. If you do combine lines, be sure to change the GOTO statements in lines 120 through 190. There are other areas which could be made into multi-line statements. Lines 530 to 580 could be combined.

There are several ways you can handle the data. A disk system would be ideal. However, the program was written for a tape cassette system for the sake of simplicity. I even tried a two-cassette system for handling the data

[illegible]

files, but found it took much longer to get the job done. In addition, looking up and changing data when I made an entry mistake proved inconvenient. By using the data at the end of the program and using only 16K, I can put three months or one quarter year of data in one program, and use one tape for each technician. Putting one program, with data, for each technician on a separate tape may seem a strange way to get the job done but it does work without a lot of hassle. I purchased 3 cassette tapes for 99 cents at a local discount store. I guess that's one reason I don't mind using many tapes. For 18 technicians the tape cost is only \$5.94. One additional data receiving tape brings the total tape cost to under \$6.30 without tax. These tapes seem to work very well in my TRS-80; I've purchased over 27 and had to discard only one.

If you are using a TRS-80, you may

be able to delete line 80 POKE 16553,255 in Part 1 and line 230 POKE 16553,255 in Part 2. I spent two frustrating hours trying to figure out why my TRS-80 would give "OUT OF DATA" errors at various times. Just when I thought the program was working, the errors would appear again. In searching through some factory update information I found that some, not all, TRS-80 computers require the POKE statement immediately before a read statement when using PRINT#-1 and after an INPUT#-1 statement. Perhaps this tip will help those of you who have a TRS-80 like mine.

If you are using the G2 Level III in the TRS-80 with the interface, be sure to turn off the real time clock by inserting `CMD" T"` before running either program; otherwise the `PRINT#-1` and the `INPUT#-1` statements will not work properly. □

1. Write program Part 1 and Part 2.
2. Make a copy of Part 1 for each technician.
3. Insert a program tape Part 1 into recorder and LOAD.
4. Add data from Daily Work Load to end of each program. Check listed program Part #1 for data entry sequence. Lines 1360 to 1420 are one day's work.
5. Do the above for each technician.
6. After each technician's tape Part 1 has new or updated data go to step 7.
7. LOAD a technician's tape Part 1 into computer, then remove tape from recorder.
8. Turn on receiving tape and recorder.
9. Turn on printer.
10. RUN program in computer.
11. Do not rewind receiving tape, remove from recorder.
12. Repeat steps 7, 8, 10 and 11.
13. After all technicians' tapes have been completed, insert tape containing program Part 2 into recorder.
14. Set recorder to play position.
15. Turn on printer if you turned it off after step 12.
16. RUN program Part 2.

Program Notes (Part 1)

- 40 Insert technician's identification in each program.
- 60 When using a line printer with the TRS-80, LPRINT is required to send information to the printer. When LPRINT is followed by "", a blank line occurs in the printout.
- 90 A=Time spent in home on call.
B\$=Classification or type of call.
C=Total miles driven during day.
D=Total minutes worked in the day.

- 490 Format for printing: # for numbers; % % for letters.
- 600-740 Control to next statement if no activity in the given category.
- 1450 Several data statements should be put on one line to conserve memory. They are one to a line in the listed program for demonstration purposes and ease in typing the program to the printouts.
- 1500 Remove and add to end of your last data statements.

DATA

AMOUNT	TYPE	PERCENT	TIME
2	A	15.38	95
2	B	15.38	65
2	C	15.38	158
2	D	7.69	3
1	E	15.38	3
2	F	7.69	3
1	G	7.69	3
1	H	7.69	3

13

OBS

1. THIS REPORT BASED ON

2. TOTAL OF 900 MINUT

3. EQUIVILANT OF 2.00

4. AVG. NUMBER CALLS

5. TOTAL COMPLETED C

6. MUST RETURN FOR L

7. TOTAL OF 204 MI

8. AVERAGE OF \$ 88

9. AVG. MINUTES II

A = COMPLETED IN
B = COMPLETED CC
C = COMPLETED CI
D = COMPLETED C

DATA

AMOUNT	TYPE	PERCENT	TIME	F
3	A	17.65	105.6	
0	B	0.00	0.0	
2	C	11.76	60.0	
3	D	17.65	143.0	
0	E	0.00	0.0	
2	F	11.76	2.0	
2	G	11.76	2.0	
5	H	29.41	1.0	

17

OBS

1. THIS REPORT BASED ON

2. TOTAL OF 900 MINUT

3. EQUIVILANT OF 2.00

4. AVG. NUMBER CALLS

5. TOTAL COMPLETED C

6. MUST RETURN FOR L

7. TOTAL OF 100 Y

8. AVERAGE OF \$

9. AVG. MINUTES

A = COMPLETED
B = COMPLETED
C = COMPLETE!
D = COMPLETE!

REPORT DATE OCTOBER 14 1979

DATA FOR TECHNICIAN BARRY ID #1

AMOUNT	TYPE	PERCENT	TIME	AVG. TIME	INCOME\$
2	A	14.29	55.0	27.5	
1	B	14.29	85.0	42.5	
3	C	7.14	35.0	35.0	
0	D	21.43	157.0	52.3	74.95
1	E	0.00	0.0	0.0	188.15
3	F	7.14	15.0	15.0	
2	G	21.43	80.0	26.7	
2	H	14.29	65.0	32.5	

14

OBSERVATIONS

1. THIS REPORT BASED ON A TOTAL OF 14 CALLS.

2. TOTAL OF 900 MINUTES WORKED OF WHICH 492.00 WERE SPENT IN HOME (54.67 %)

3. EQUIVILANT OF 2.00 DAYS WORKED

4. AVG. NUMBER CALLS PER DAY 7.00

5. TOTAL COMPLETED CALL PERCENTAGE 57.14

6. MUST RETURN FOR LACK OF PARTS PERCENTAGE 0.00

7. TOTAL OF 117 MILES DRIVEN AT AN AVERAGE OF 8.36 MILES PER CALL.

8. AVERAGE OF \$ 62.72 PER CASH CALL ... \$ 74.95 PER CHARGE CALL

9. AVG. MINUTES IN HOME PER CALL 35.14

A = COMPLETED IN WARRANTY
B = COMPLETED CONTRACT
C = COMPLETED CHARGE CALL
D = COMPLETED CASH CALL

E = MUST RETURN LACK PARTS
F = PARTS PICK UP
G = MDS. RETURN SHOP - NOT WORKING
H = TO SHOP FOR SERVICE

OCTOBER 14 1979

SUMMATION OF ALL TECHNICIANS

ID #	AVG. TIME COMPLETE %	MR%	AVG CALLS	AVG MILES	TO SHOP	AVG \$ PER	AVG - TIME	TOTAL	DAYS
	IN HOME		PER DAY	PER CALL	%	PAID CALL	PAID TS	OF CALLS	WORKED
ID #1	35.14	57.14	0.00	7.00	8.36	14.29	65.78	48.0	32.5
ID #2	43.54	61.54	7.69	6.50	15.69	7.69	62.83	61.5	40.0
ID #3	29.65	47.06	0.00	8.50	5.88	29.41	54.44	40.6	26.2
	36.11	55.25	2.56	7.33	9.98	17.13	61.01	50.0	32.9
								14.67	

DEPARTMENT AVERAGES.

THIS REPORT BASED ON 44 CALLS

Program Part 1 Listing

```

6 REM KEEPING TABS ON TECHNICIANS (PART #1.)
8 REM BY CLINT HENTZ .
10 REM BASED ON SEVEN & ONE HALF HR. WORK DAY.
20 INPUT "REPORT DATE"; D$
30 LPRINT "REPORT DATE "; D$
40 A$="BARRY ID #1"
45 LPRINT TAB(30) " DATA FOR TECHNICIAN "; A$
50 LPRINT TAB(30) "-----"
60 LPRINT " "
70 LPRINT " "
80 POKE 16553, 255
90 READ A, B$, C, D, E
100 IF A=-1 GOTO 460
110 S=S+1: S2=S2+1: V=V+D: R=R+C
120 IF B$="A" GOTO 200
130 IF B$="B" GOTO 230
140 IF B$="C" GOTO 260
150 IF B$="D" GOTO 300
160 IF B$="E" GOTO 340
170 IF B$="F" GOTO 370
180 IF B$="G" GOTO 400
190 IF B$="H" GOTO 430
200 A1=A1+1
210 T1=T1+A
220 GOTO 90
230 B1=B1+1
240 T2=T2+A
250 GOTO 90
260 C1=C1+1
270 T3=T3+A
280 U1=U1+E
290 GOTO 90
300 D1=D1+1
310 U2=U2+E
320 T4=T4+A

```

```

330 GOTO 90
340 E1=E1+1
350 T5=T5+A
360 GOTO 90
370 F1=F1+1
380 T6=T6+A
390 GOTO 90
400 G1=G1+1
410 T7=T7+A
420 GOTO 90
430 H1=H1+1
440 T8=T8+A
450 GOTO 90
460 LPRINT "*****"
470 LPRINT "AMOUNT TYPE PERCENT TIME AVG TIME INCOME$"
480 LPRINT "*****"
490 M$= " ### % % ### ## ### # ### # ### ##"
500 S1=A1+B1+C1+D1+E1+F1+G1+H1
510 S2=A
520 M=A1/S*100
530 M2=B1/S*100
540 M3=C1/S*100
550 M4=D1/S*100
560 M5=E1/S*100
570 M6=F1/S*100
580 M7=G1/S*100
590 M8=H1/S*100
600 IF A1=0 GOTO 620
610 X1=T1/A1
620 IF B1=0 GOTO 640
630 X2=T2/B1
640 IF C1=0 GOTO 660
650 X3=T3/C1
660 IF D1=0 GOTO 680
670 X4=T4/D1
680 IF E1=0 GOTO 700

```

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```

690 X5=T5/E1
700 IF F1=0 GOTO 720
710 X6=T6/F1
720 IF G1=0 GOTO 740
730 X7=T7/G1
740 IF H1=0 GOTO 760
750 X8=T8/H1
760 LPRINT USING M$;A1,"A",M,T1,X1
770 LPRINT USING M$;B1,"B",M2,T2,X2
780 LPRINT USING M$;C1,"C",M3,T3,X3,U1
790 LPRINT USING M$;D1,"D",M4,T4,X4,U2
800 LPRINT USING M$;E1,"E",M5,T5,X5
810 LPRINT USING M$;F1,"F",M6,T6,X6
820 LPRINT USING M$;G1,"G",M7,T7,X7
830 LPRINT USING M$;H1,"H",M8,T8,X8
840 Z=T1+T2+T3+T4+T5+T6+T7+T8
850 U9=U1+U2
860 D9=C1+D1
870 D8=U9/D9
880 T9=T3+T4
890 X9=T9/D9
900 LPRINT"-----"
910 U9=U1+U2
920 Q$="####          #####"
930 LPRINT USING Q$;S1,Z,Z/S1,U9
940 LPRINT"-----"
950 LPRINT" "
960 LPRINT TAB(20)"OBSERVATIONS"
970 LPRINT TAB(20)"-----"
980 LPRINT" "
990 W=V/450
1000 LPRINT"1. THIS REPORT BASED ON A TOTAL OF ";S1;" CALLS."
1010 LPRINT" "
1020 P$="2. TOTAL OF ##### MINUTES WORKED OF WHICH ##### ##
WERE SPENT IN HOME <##.## %>"
1030 LPRINT USING P$;V,Z,Z/V*100
1040 LPRINT" "
1050 H1=V/450
1060 L$="3. EQUIVILANT OF ###.## DAYS WORKED"
1070 LPRINT USING L$;V/450
1080 LPRINT" "
1090 K$="4. AVG. NUMBER CALLS PER DAY ##.##"
1100 LPRINT USING K$;S1/H1
1110 LPRINT" "
1120 V4=A1+B1+C1+D1
1130 V5=V4/S1*100
1140 P$="5. TOTAL COMPLETED CALL PERCENTAGE ##.##"
1150 LPRINT USING P$;V5
1160 LPRINT" "
1170 V9=E1/S1*100
1180 W$="6. MUST RETURN FOR LACK OF PARTS PERCENTAGE ##.##"
1190 LPRINT USING W$;V9
1200 LPRINT" "
1210 T$="7. TOTAL OF ##### MILES DRIVEN AT AN AVERAGE OF ##.## MILES PER CALL."
1220 LPRINT USING T$;R,R/S1
1230 LPRINT" "
1240 R$="8. AVERAGE OF #####.## PER CASH CALL ... #####.## PER CHARGE CALL"
1250 LPRINT USING R$;U2/D1,U1/C1
1260 LPRINT" "
1270 S$="9. AVG. MINUTES IN HOME PER CALL ###.##"
1280 LPRINT USING S$;Z/S1
1290 LPRINT" "
1300 LPRINT"-----"
1310 LPRINT"A = COMPLETED IN WARRANTY          E = MUST RETURN LACK PARTS"
1320 LPRINT"B = COMPLETED CONTRACT              F = PARTS PICK UP"
1330 LPRINT"C = COMPLETED CHARGE CALL          G = MDS. RETURN SHOP - NOT WORKING"
1340 LPRINT"D = COMPLETED CASH CALL              H = TO SHOP FOR SERVICE"
1350 PRINT#-1,A$,Z/S1,V5,V9,S1/H1,R/S1,M8,D8,X9,X8,S1,V/450
1360 DATA 45,B,0,0,0
1370 DATA 15,F,0,0,0
1380 DATA 35,A,0,0,0
1390 DATA 40,B,0,0,0
1400 DATA 30,H,0,0,0
1410 DATA 35,C,0,0,74.95
1420 DATA 55,D,50,450,69.95
1430 DATA 25,G,0,0,0
1440 DATA 35,H,0,0,0
1450 DATA 20,A,0,0,0
1460 DATA 55,D,0,0,55.70
1470 DATA 47,D,0,0,62.50
1480 DATA 30,G,0,0,0
1490 DATA 25,G,67,450,0
1500 DATA -1,-1,-1,-1,-1
1510 END

```

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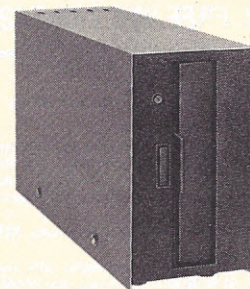
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Video Output: 1.5 P/P into 75 ohm (EIA RS-170) • **Baud Rate:** 110 and 300 ASCII • **Outputs:** RS232-C or 20 ma. current loop • **ASCII Character Set:** 128 printable characters—

! " # \$ % & ' () * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\] ^
_ ` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~

BAUDOT Character Set: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z . ? , * 3 \$ # () , 9 0 1 4 5 7 ; 2 / 6 8 •
Cursor Modes: Home, Backspace, Horizontal Tab, Line Feed, Vertical Tab, Carriage Return. Two special cursor sequences are provided for absolute and relative X-Y cursor addressing •
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Address _____

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CIRCLE 37

Data from James ID 2

```
1340 DATA 25, B, 0, 0, 0
1350 DATA 120, C, 0, 0, 35. 10
1360 DATA 55, A, 0, 0, 0
1370 DATA 40, B, 0, 0, 0
1380 DATA 38, D, 94, 450, 42. 95
1390 DATA 50, D, 0, 0, 133. 30
1400 DATA 15, F, 0, 0, 0
1410 DATA 20, F, 0, 0, 0
1420 DATA 40, A, 0, 0, 0
1430 DATA 38, C, 0, 0, 39. 95
1440 DATA 50, G, 0, 0, 0
1450 DATA 35, E, 0, 0, 0
1460 DATA 40, H, 110, 450, 0
1470 DATA -1, -1, -1, -1, -1
1480 END
```

Data from Robert ID 3

```
1340 DATA 25, H, 0, 0, 0
1350 DATA 30, C, 0, 0, 28. 75
1360 DATA 40, D, 0, 0, 37. 50
1370 DATA 60, D, 0, 0, 107. 50
1380 DATA 28, H, 0, 0, 0
1390 DATA 25, A, 0, 0, 0
1400 DATA 20, G, 0, 0, 0
1410 DATA 23, H, 54, 450, 0
1420 DATA 10, F, 0, 0, 0
1430 DATA 20, A, 0, 0, 0
1440 DATA 60, A, 0, 0, 0
1450 DATA 30, H, 0, 0, 0
1460 DATA 10, F, 0, 0, 0
1470 DATA 30, C, 0, 0, 29. 95
1480 DATA 25, G, 0, 0, 0
1490 DATA 25, H, 0, 0, 0
1500 DATA 43, D, 46, 450, 68. 50
1505 DATA -1, -1, -1, -1, -1
1510 END
```

Program Part 2 Listing

```
10 REM KEEPING TABS ON TECHNICIANS BY CLINT HENTZ. PART #2.
20 REM THIS PART COMPARES TECHNICIANS AGAINST AVERAGES.
30 REM RUN MAIN PROGRAM (PART #1) FIRST. THEN
35 REM INSERT DATA RECEIVING TAPE IN RECORDER &
40 REM SET RECORDER TO PLAY POSITION. (CHECK VOLUME CONTROL)
50 REM TURN PRINTER ON THEN RUN THIS PROGRAM.
60 INPUT "DATE OF THIS REPORT (DO NOT USE COMMAS)"; D$
70 LPRINT TAB(45) D$
80 LPRINT " "
90 LPRINT TAB(38) "SUMMATION OF ALL TECHNICIANS"
100 LPRINT TAB(38) "-----"
110 LPRINT " "
120 LPRINT " "
130 LPRINT "*****";
140 LPRINT "*****";
150 LPRINT "ID # AVG. TIME COMPLETE % MR% AVG CALLS AVG MILES TO SHOP AVG $ PER AVG. - TIME ";
160 LPRINT "TOTAL DAYS"
170 LPRINT "IN HOME PER DAY PER CALL % PAID CALL PAID TS ";
180 LPRINT "OF CALLS WORKED"
190 LPRINT "*****";
200 LPRINT "*****";
210 LPRINT " "
220 INPUT #1, A$, B, C, D, E, F, G, H, I, J, K, L
230 POKE 16553, 255
240 V=V+1
250 M$=" "
260 M1$=" "
270 LPRINT USING M$; RIGHT$(A$, 5), B, C, D, E, F, G;
280 LPRINT USING M1$; H, I, J, K, L
290 L5=L5+B
300 M5=M5+C
310 N5=N5+D
320 O=O+E
330 P=P+F
340 Q=Q+G
350 T=T+H
360 T3=T3+I
370 T4=T4+J
380 T5=T5+K
390 REM R9 IS TOTAL DAYS WORKED. I DID NOT USE IN PRINT OUT.
400 R9=R9+L
410 IF V=3 GOTO 430
420 GOTO 220
430 LPRINT "-----";
440 LPRINT "-----"
450 N$=" "
460 N1$=" "
470 LPRINT USING N$; L5/3, M5/3, N5/3, O/3, P/3, Q/3;
480 LPRINT USING N1$; T/3, T3/3, T4/3, T5/3
490 LPRINT TAB(45) "DEPARTMENT AVERAGES. "
500 LPRINT "-----";
510 LPRINT "-----"
520 LPRINT " "
530 LPRINT TAB(38) "THIS REPORT BASED ON "; T5; " CALLS"
540 END
```


Create Your Own Periodical Guide

BY MARGARET WHACK

If you've caught the computer bug, you probably subscribe to several of the magazines devoted to home computers. Remembering where you saw every single article, simulation, game, application program or software review of interest is impossible. You need an index to your personal computing library of information. Not only does an index save you time in locating the data you want, but it also brings to memory articles, games and applications you may have forgotten about.

This program gives you a quick and easy way to index your magazines. You can use it for books and other information sources as well — not only in the personal computing field, but other areas, too.

The program first lists out various categories and their codes under which the data is stored. It asks you which category you wish to see. Enter the code number and hit return. After listing all of the entries stored in that particular category, the program gives you the option to see another category.

What categories you choose for your index will depend entirely on your own individual interests. For example, since I own a Pet two of the index categories are specifically Pet-related. In addition, while glancing through my magazines, I often run across a product which I intend to buy in the future. When the time comes to make the purchase, the index category "To Purchase" brings the product information to my fingertips.

Categories are defined in lines 20 to 36. You may include as few or as many categories as you need. Just be sure to change line 10 and line 45 to indicate the number of categories you're using.

Information is read in through DATA statements. Each input DATA line follows the format:


```
NNN DATA C, Subject, Source,
      YYMM, Pg#
500 DATA 14, PEEK & POKE, CRE
      COMP, 7902, 34
```

"C" is the code number of the category. "Subject" describes the data and

Program Listing

```
1 REM INFORMATION INDEX BY MARGARET WHACK WRITTEN IN BASIC
2 REM FOR THE 2001 PET COMPUTER
3 PRINT "CLR"
5 PRINT TAB(5) "**** INFORMATION INDEX ****":PRINT
10 DIM M$(17)
20 M$(1)="1  APPLICATIONS"
21 M$(2)="2  'BASIC' PROGRAMS"
22 M$(3)="3  BOOK REVIEWS"
23 M$(4)="4  EDUCATIONAL"
24 M$(5)="5  GAMES"
25 M$(6)="6  GRAPHICS"
26 M$(7)="7  HARDWARE REVIEWS"
27 M$(8)="8  INTERESTING ARTICLES"
28 M$(9)="9  LANGUAGES"
29 M$(10)="10 MATH APPLICATIONS"
30 M$(11)="11 MISCELLANEOUS"
31 M$(12)="12 'PET' PROGRAMS"
32 M$(13)="13 'PET' ROUTINES"
33 M$(14)="14 PROGRAMMING HOW-TO'S"
34 M$(15)="15 PROGRAMMING TIPS"
35 M$(16)="16 SOFTWARE REVIEWS"
36 M$(17)="17 TO PURCHASE???"
40 PRINT:PRINT "THE CATEGORIES AND THEIR CODES ARE:":PRINT
45 FOR I= 1 TO 17:PRINT M$(I):NEXT I
50 PRINT:PRINT "WHICH CATEGORY DO YOU WISH TO SEE";
55 INPUT I:PRINT:PRINT TAB(2);"### ";M$(I);" ###":PRINT
60 PRINT "SUBJECT";TAB(19);"SOURCE";TAB(31);"DATE";TAB(36);"PG#"
65 PRINT "-----";TAB(19);"-----";TAB(31);"-----";TAB(36);"----"
70 PRINT
75 FOR J= 1 TO 100
80 READ C,A$,B$,C$,D$
85 IF C=I THEN PRINT A$,TAB(19);B$,TAB(31);C$,TAB(36);D$
100 NEXT J
150 RESTORE
200 PRINT:PRINT "DO YOU WISH TO SEE ANOTHER CATEGORY Y/N";
205 GET Z$:IF Z$="" THEN 205
207 IF Z$="Y" THEN 40
500 DATA 14,PEEK & POKE,CRE COMP,7902,34
501 DATA 7,APPLE,HOBBY COMP,1979,65
502 DATA 5,SPACE MAZE,CRE COMP,7901,112
503 DATA 16,MICROCHESS,PET PAPER,7812,17
504 DATA 8,COMPUTER HIST,BYTE,7807,84
505 DATA 7,COSMAC,PERS COMP,7903,20
506 DATA 1,BUDGET,PERS COMP,7903,14
507 DATA 5,INFLAT/DEFLAT,CRE COMP,7809,44
9999 END
```


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CIRCLE 57

may take up to 18 spaces. "Source", the periodical from which the data came, can be up to 11 spaces long. YYMM is the date format and "Pg#" is the page number, which can be up to 4 spaces.

Since I wrote the program for my Pet, I was limited to a 40-character display. If your computer has a larger screen display, you won't have to abbreviate the descriptions and magazine titles as I did:

PERS COMP - *Personal Computing*
CRE COMP - *Creative Computing*

Keep a count of the number of DATA statements you enter. Line 75 states the number of DATA statements stored in the program (currently, my program uses 100 DATA statements) and you

have to change the number as you add new entries.

DATA statements begin at line 500 and are restricted in number only by the amount of memory available. The program text requires 1000 bytes, allowing about 155 entries for 8K of memory.

When you run out of memory, simply begin a new index. Resave the program and delete all the DATA statements. You can divide your indexes by the year or even into 6 month periods — January to June 1979, for example. If you collect a lot of information on one particular subject — say, for example, Computer Languages — then you can make that subject into a separate index, adding more category headings such as Fortran, BASIC and Pascal. □

Sample Run

THE CATEGORIES AND THEIR CODES ARE:

- 1 APPLICATIONS
- 2 'BASIC' PROGRAMS
- 3 BOOK REVIEWS
-
- 16 SOFTWARE REVIEWS
- 17 TO PURCHASE???

WHICH CATEGORY DO YOU WISH TO SEE? 7

HARDWARE REVIEWS

SUBJECT	SOURCE	DATE	PG#
APPLE	HOBBY COMP	1979	65
COSMAC	PERS COMP	7903	20
BUYING GUIDE	PERS COMP	7812	14
PET VS TRS80	PERS COMP	7901	30
VIDEOBRAIN	CRE COMP	7810	20
ELECT PENCIL	CRE COMP	7902	30

DO YOU WISH TO SEE ANOTHER CATEGORY Y/N?

(Hit Y and the program relists the categories and their codes)

WHICH CATEGORY DO YOU WISH TO SEE? 5

GAMES

SUBJECT	SOURCE	DATE	PG#
SPACE MAZE	CRE COMP	7901	112
INFLAT/DEFLAT	CRE COMP	7809	44
HAMURABI SOLVER	PERS COMP	7901	43
BASKETBALL	PERS COMP	7901	50
ATOM20	CRE COMP	7901	136

DO YOU WISH TO SEE ANOTHER CATEGORY Y/N?

(Hit N and the program goes to END)

HARRY SHERSHOW — Dept. Editor
MORRIS MILLER — Chess Annotator

Two New Programs Are Tested

John Urwin, of 1537 Argyle Ct., San Jose, CA 95132, a systems programmer and supervisor at Cromemco, reports that his "chess tournaments" are doing quite well. He has received many inquiries and some programs have been sent in for testing. John stages chess matches for *all* chess programs (amateur and commercial) as well as machines. He also pits programs and devices against rated human players.

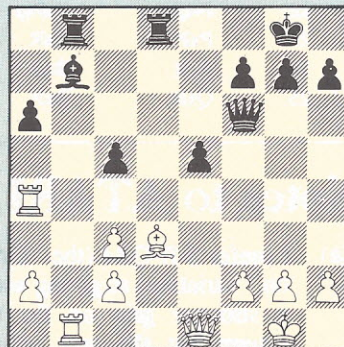
In the following report, John, whose last rating was 1275 (but who had beaten a 1475 player in a recent official USCF tournament) tests his own ability against MYCHESS, a new chess program for the CROMEMCO. The program was written by Dave Kittinger of Alaska and programmed to run on the Cromemco Z2 system (CDOS or CP/M). It is written in Z-80 assembly language with less than 20K memory and a large opening book. Urwin contributed much of the opening book to MYCHESS. The program is available for \$20 from David Kittinger, 2431 Lyvona Lane, Anchorage, AK 99502. For your money you get a copy of the source code plus the object code on either an 8" or 5" floppy. John says he believes MYCHESS plays about 1500 chess.

Last month, reports John, the Vallco Village Shopping Center of Santa Clara, CA was the site of the third annual "Challenge the Masters." The event was sponsored by Vallco Fashion Park and hosted by the Santa Clara Chess Club directed by John Sumeries. Chief players included International Grand Master Peter Biyiasas, Life Master Dennis Fritzing, National Master George Kane, Computer Chess Program, MYCHESS, (on Cromemco) and Xenarbor 4 (on Control Data). Challengers from the public were invited to test the above named players and earn a \$10 gift for winning or a \$5 gift certificate for drawing. Results of the Shopping Center event will be reported in a forthcoming issue of P.C.

Game

MYCHESS vs JOHN URWIN

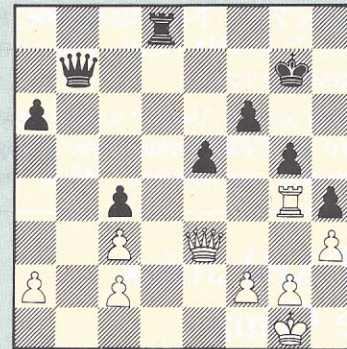
	White	Black
1.	P-K4	P-QB4
2.	N-KB3	N-QB3
3.	P-Q4	PxP
4.	NxP	P-K4 (a)
5.	NxN	NPxN
6.	N-B3	N-B3
7.	B-KN5	B-N5
8.	BxN	QxB
9.	B-Q3	B-N2
10.	O-O	O-O
11.	B-B4	BxN
12.	PxB	KR-Q1
13.	R-N1	QR-N1
14.	R-K1	P-Q4
15.	B-Q3	PxP
16.	RxP	P-QB4
17.	R-QR4	P-QR3
18.	Q-K1(b)	



Position after white's 18th move:
Q-K1 (note b)

White-MYCHESS...Black-URWIN

18.	Q-B3
19.	R-KN4	P-KR4
20.	R-KN5	P-B3
21.	R-KN3	P-N4 (c)
22.	Q-K3	P-R5
23.	R-KN4	K-N2
24.	P-KR3	P-B5 (d)
25.	B-K4	Q-B2
26.	BxB	RxB
27.	RxR	QxR (e)



Position after black's 27th move:
QxR (note e)

28.	RxPch	PxR? (f)
29.	QxPch	K-B2
30.	QxR	Q-N8ch
31.	K-R2	QxBP
32.	Q-Q5ch	K-B3
33.	QxBP	QxKBP
34.	QxQRPch	K-B4
35.	Q-B8ch	K-B5
36.	Q-KB8ch	K-K6
37.	Q-B5ch	K-K7
38.	QxPch	K-B8
39.	Q-QN5ch	K-K8
40.	Q-N1ch	K-K7
41.	Q-N2ch	K-K6
42.	Q-N6ch	K-K7
43.	QxQch	KxQ
44.	P-R4	Resigns (g)

Notes to game

(a) A playable line but I prefer 4...N-KB3. The text may lead to a backward queen pawn or other problems, for instance: 4...P-K4; 5-N-KB3, N-B3; 6-N-B3; B-N5; 7-B-B4, NxP; 8-BxPch, KxB; 9-Q-Q5ch and QxB.

Or: 7-B-B4, P-Q3; 8-N-N5 etc.

But the move in the game strengthens black's center and helps pre-

continued on next page

(Continued from preceding page)

- pare for the P-Q4 push by black.
- (b) Well played! If 18-Q-K2?, P-K5 and white cannot capture either the KP or RP because of the mate on the back rank, after the exchanges. And if 19-B-B4, B-B3 again threatening the rook and a back rank mate.
- (c) An interesting idea but more solid seems 21-... P-R5; 22-R-KN4, P-R6; 23-R-KN3 (best), with some attack for black.
- (d) Now simply 25-BxP wins a pawn but MYCHESS enters into a long-headed combination. While not

sound, the program's long range lookahead augurs well for its future development.

- (e) Not 28-RxBP, Q-N8ch; 29-K-R2, R-Q8;
- (a) 30-P-N3, R-R8ch; 31-K-N2, Q-QB8ch and QxR.
- (b) 30-R-B7ch, K-R3; 31-P-N3, R-R8ch; 32-K-N2, Q-KB8ch; 33-K-B3, Q-Q8ch;
- (A) 34-Q-K2, P-K5ch; 35-K-K3, R-K8 etc.
- (B) 34-K-N2, Q-Q4ch; 35-P-B3 (if Q-B3, R-N8ch), Q-Q8; 36-Q-B2, R-K8 etc.
- (f) But now 28-... K-B2!

- (g) MYCHESS showed an impressive eagerness to enter into an exchanging combination. Its 18th move indicates ready grasp of midgame needs, but most impressive of all was its endgame technique.

The most difficult of all endings (except the two knights against enemy king and pawn, which rarely arises) is one with queens and pawns, when the possibilities of checks make calculation most difficult. MYCHESS steered through the shoals.

—Morris Miller

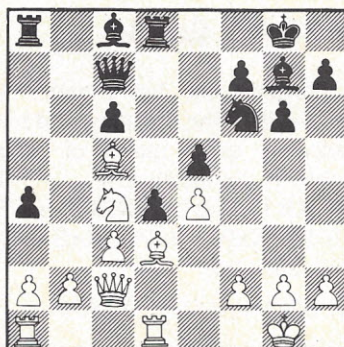
ATARI Joins the Gang

Having played MYCHESS, (and lost) John Urwin next tried his luck

with the newly released ATARI Chess Game (and managed to get a draw.) "Atari," says John, "should have its micro-chess game on the market by this time. The chess program is for the Atari 400 or 800 computer with an equivalent

program for the video game. I am impressed with the playing strength, although, at times, the computer will take too long to think on a move (sometimes 20 minutes). The following game was played at Atari-Chess' level 4:

	White ATARI	Black John Urwin
1.	P-K4	P-QB4
2.	N-KB3	N-QB3
3.	K-Q4	PxP
4.	NxP	P-KN3
5.	B-QB4 (a)	B-N2
6.	P-QB3	P-K4
7.	NxN (b)	NPxN
8.	B-K3	N-B3
9.	B-Q3	O-O
10.	O-O	Q-B2
11.	N-Q2	P-Q4
12.	B-B5	R-Q1
13.	Q-B2	P-Q5
14.	KR-Q1	P-QR4
15.	N-B4	P-R5 (c).



Position after Black's 15 move
White-Atari Black-Urwin

16.	B-N6	Q-Q2
17.	BxR	QxB
18.	NxP	NxP
19.	NxQBP	Q-N4
20.	BxN	R-R3
21.	PxP	B-Q2
22.	P-QN4	PxPep
23.	PxP	RxR
24.	RxR	BxN
25.	QxB	BxP

26.	R-R2	Q-N4
27.	Q-B2	Q-K3
28.	P-QN4	P-B4
29.	R-R8ch	K-N2
30.	Q-B7ch	K-R3
31.	Q-B4ch	K-N2
32.	Q-B7ch	K-R3
33.	Q-B4ch	K-N2
34.	Q-B7ch	K-R3
	Drawn (d)	

Notes to ATARI vs URWIN

- (a) I prefer 5-B-QB4 (the "Dragon" variation) as giving white a stronger grip on the Q5 square but the text, which favors rapid development, is not wrong.
- (b) Instead best is 7-N-N5 and Q6.
- (c) The human errs first. After this Atari should win easily.
- (d) B-Q3 instead of the checks protects everything.

For a brand new program starting out of nowhere, Atari plays a very solid game of chess. Its strategic concepts are very good, and as its pro-

gramming is improved it should do even better

In playing over these new chess programs, I am reminded of an old myth. Minerva (Goddess of Wisdom) was born fully grown by springing from the head of her father, Jupiter. Micro-computer-chess programmers have a similar story in their own evolution. Indeed, it is the "amateurs" doing the hard work of programming upon whom progress depends. I do not use the term "amateur" in any denigrating sense, but in its old, Latin meaning: one who does something for the love of it.

—Morris Miller

"JS" Takes the Bloss Test

"I was interested in the concept of rating chess programs by comparing their performances to rated human players," writes John Shaposka, of Wilmington, DE. "I have written a program, which I call J.S. CHESS, for the 6800. The program is very strong but has never been rated. I have therefore rated it on the Bloss method.

First a few comments:

- 1) There appears to be errors in problems 30, 65, 70, and 85.
- 2) As you know, computers can calculate forcing moves to very deep levels, but if the variation contains a "quiet" move many micros will miss the proper continuation. The problems presented are all forced mates which J.S. CHESS will find even with a 1-ply search.

I hope that Bloss' book contains other types of problems (particularly endgames) to set a better estimate of a program's true playing strength.

- 3) How do we use the system? I realize that the purpose of the article was only to introduce Bloss' system and that there probably wouldn't have been enough room for the tables anyway, but I wish you had included at least an approximate method for making the estimate —

one possible scheme might be constructed along these lines:

Using the score in Bloss' table for 5 seconds (S1), the score for 600 seconds (S2), and assuming a linear relationship the rating (R) for a solution time (T) will be:

$$R = \frac{S2-S1}{T-S1} \times S1 + 595$$

"Using this method, I tested J.S. CHESS on each of the problems. (J.S. CHESS was in its tournament playing mode i.e. 3-ply, full width search, and running at 1.65Mhz — at this setting the average response time is about 2 min.)

PROBLEM #	TIME PER MOVE (Seconds)	EST. RATING
20	34.2/2.8	1530
25	16.8/1.6	1383
30	45.2/1.6	1500
35	50.8/1.6	1577
40	22.8/3.8	1654
45	88.4/6.8	1583
50	32.0/1.8	1634
55	50.6/4.6	1529
62	46.6/23.6/1.8	1370
65	19.2/11.8/1.6	1452
70	128.4/16.6/14.2/2.6	1429
75	36.8/22.2/1.8	1593
80	32.6/23.8/5.2	1571
85	22.6/37.2/1.6	1596
AVE =		1529

"Note: The above ratings were calculated assuming the values for "LOW" and

"HIGH" as shown in the table for MICRO-CHESS are actually S1 and S2 respectively, (for illustration purposes only).

The times shown are very fast — this is because once J.S. Chess finds a mate sequence in the first stage (1-ply) of the search, it makes the indicated move immediately without going on to deeper search depths.

"Without Bloss' table the method is admittedly crude but should give a rough idea of a program's playing strength. All in all, Bloss seems to have come up with a good system and I would not hesitate to buy the book should Dr. Bloss choose to re-issue it."

In response...

The following correspondence from Gary Ratliff, who sent us the original material on the Bloss system, contains the answers to the preceding questions:

"The Bloss book provides a standard method for determining the approximate USCF rating of a person who solves the Mate-Rater problems. The positions given are those of the 14 problems (no more) in this book. The accompanying material from this book will help answer questions about the system.

"This material shows the basic method for conducting the experiment.

Classifieds

Rates for advertising in this section: \$1 per word. Minimum: 15 words. Allow two months for appearance (usual publication lag). Announcements of human tournaments that are open to computers published without charge. Send all submissions for this section to COMPUTER-CHESS CLASSIFIED DEPARTMENT.

POSTAL CHESS

First Annual North American Open Computer Postal Chess Tournament. All computers welcome to enter. Your computer program will be matched against three other computer programs in two consecutive games in a Round Robin Tournament. Trophy to all first place finishers. For further information regarding details of tournament and the required entry fee, write to VARN FIELDS, PO Box 8202, Philadelphia, PA 19101.

NEW PROGRAM FOR SALE

"MY-CHESS", computer chess program, runs on Cromemco Z-2 system (CDOS or CP/M). Chess program is written in Z-80 with less than 20K memory and large opening book. Does a full-width two ply search in 5 seconds (4 MHz clock.) Price \$20 which includes a copy of the source code and object code on either an 8" or 5" floppy. DAVID KITTINGER, 2431 Lyvona Lane, Anchorage, AK 99502.

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The GAMMON CHALLENGER gives all backgammon players a battle! Has three levels of play. Switches sides, tests problems and stores positions in memory. Available on TRS80 cassettes for either Level 1 or Level 2. \$14.95 each. Computer Cablevision, 2617 42nd Street, NW Washington DC 20007.

TWO FOR ONE BARGAIN

High quality cassette with an OTHELLO program on one side and a real-time LUNAR LANDER program on the other. The OTHELLO program has a neat graphical display, five levels of play, and easily destroys the other OTHELLO programs I have seen. Send \$10 to Peter Frey, 2407 Prospect Avenue, Evanston, IL 60201.

The program Microchess 2.0, for example, was loaded into my PET. The edit function was used to set up problem 20 (the first of the 14 Mate-Rater problems). The X command changed the computer from playing the Black pieces to playing the White pieces. The P command forces Microchess 2.0 to start play and resets the chess clock to zero. The time shown on the clock and the move made by the computer were recorded and the response of Black was entered into the computer. Then the second move of the program and the time shown on the chess clock was recorded. This time was converted into seconds and the result rounded to the nearest ten second interval as is done in

the table. (See the Table for Mate-Rater 20) The three results: rating, low, and high were entered into the results table. Each of the remaining 13 problems was entered into the computer in the same way and the results recorded as above. In the event that the program failed to solve the position correctly, the time was changed to 10 minutes or 600 sec. (This is the same method used for the human players who were tested and is explicitly mentioned in the section on the Statistical Basis for the Mate-Rater Tables.)

"The process is that of a teacher administering a standardized test to a student. The material in Bloss' book provides the test problems and the grad-

ing scale. The computer or student provides the way it answers the problem. This answer may be used on other chess playing programs; however, since most programs lack a built in chess clock, the person testing a program must use a stop watch to determine the exact response time taken by the computer.

"Although a computer was used to solve the regression curve fit in 1972 as explained in the book's statistics section, the same capabilities are now available on the TI-58 or TI-59 when the Stat module is inserted in the back. This set of 21 programs is a real workhorse for people doing statistical work.

"The terms 'rating', 'high', and

Following are some extracts from Prof. Bloss' book pertaining to this discussion:

Statistical Basis for the Mate-Rater Tables

Forty-two problems were tentatively selected as mate-rater problems. They were tested on 43 players with current USCF ratings. For each problem the player recorded his solution and the time required to solve. If no solution was found within 10 minutes, the player was instructed to record his time as 10 minutes and to go to the next problem. Similarly, if the solution was found to be incorrect, a time of 10 minutes was substituted for the time the player had actually recorded. This imparted a bias to the results but, short of asking the tested players to spend unlimited time until they obtained solutions for all problems, it seemed unavoidable.

The data for each problem were then analyzed statistically. For example, the following types of equations were successively fit by the method of least squares to the data for Mate-Rater 35.

$$R_c = a + bt \quad (\text{eq. 1})$$

$$R_c = a + bt + ct^2 \quad (\text{eq. 2})$$

$$R_{\text{calc}} = at^b \quad (\text{eq. 3})$$

$$R_c = ae^{bt} \quad (\text{eq. 4})$$

$$R_c = ab^t \quad (\text{eq. 5})$$

The active equations used to calculate R_{calc} , the USCF "rating" of the tables, for correct performances in t seconds, were:

Mate-Rater 20,	$R_{\text{calc}} = 2280t^{-0.0871}$
Mate-Rater 25,	$R_{\text{calc}} = 2522t^{-0.1034}$
Mate-Rater 30,	$R_{\text{calc}} = 2594t^{-0.1035}$
Mate-Rater 35,	$R_{\text{calc}} = 2899t^{-0.1238}$
Mate-Rater 40,	$R_{\text{calc}} = 2511t^{-0.0983}$
Mate-Rater 45,	$R_{\text{calc}} = 2464t^{-0.0907}$
Mate-Rater 50,	$R_{\text{calc}} = 2747t^{-0.1100}$
Mate-Rater 55,	$R_{\text{calc}} = 2488t^{-0.0889}$
Mate-Rater 62,	$R_{\text{calc}} = 3400t^{-0.1610}$
Mate-Rater 65,	$R_{\text{calc}} = 2190t^{-0.0773}$
Mate-Rater 70,	$R_{\text{calc}} = 2427t^{-0.0946}$
Mate-Rater 75,	$R_{\text{calc}} = 2240t^{-0.0723}$
Mate-Rater 80,	$R_{\text{calc}} = 2559t^{-0.0879}$
Mate-Rater 85,	$R_{\text{calc}} = 2632t^{-0.0887}$

The computer program also compared the standard error of estimate of R_{calc} for each Mate-

Rater. This permitted the calculation of R_L and R_H , the low and high values between which the reader's true USCF rating would likely fall in about two-thirds of the cases.

In the foregoing equations, R_c or R_{calc} indicates the calculated USCF rating, t indicates time required to solve the problem, whereas a , b and c are constants whose values were determined by regression analyses. The symbol e represents the base of natural logarithms, that is, 2.7182818...

For the five equations, the statistical analysis indicated a negative value for the parameter b as well as for the coefficient of correlation between R and t . In other words, players with higher USCF ratings were likely to require less time to solve Mate-Rater 35. Substituting for a , b and c their least common square estimates as obtained by statistical analyses of the data for Mate-Rater 35, Equations 1 to 5 become:

$$R_c = 1793 - 0.983t \quad (\text{eq. 1})$$

$$R_c = 1881 - 2.05t + 0.00177t^2 \quad (\text{eq. 2})$$

$$R_{\text{calc}} = 2899t^{-0.1238} \quad (\text{eq. 3})$$

$$R_c = 1797e^{-0.00064t} \quad (\text{eq. 4})$$

$$R_c = 1796(0.9994)^t \quad (\text{eq. 5})$$

The correlation coefficient for equation 3 (-0.79) was little better than for equation 4 (-0.78) or for equations 1 and 5 (-0.76 for each). However, if t is set equal to zero in each of the five equations, the calculated USCF rating is 1793 (eq. 1), 1881 (eq. 2), infinity (eq. 3), 1797 (eq. 4) and 1796 (eq. 5). Thus equation 3 yields the more believable results because only a being of infinite intelligence (and thus capable of an infinite USCF rating) could solve Mate-Rater 35 in zero seconds! Hence only equations of the type indicated by equation 3 were fit to the data for the various mate-raters.

When this was done for the 42 problems originally tested, only 14 yielded correlation coefficients more significant than -0.70. These problems then became the 14 Mate-Raters. They provided a meaningful (inverse) relationship between a player's rating and his time for solving the problem. For these 14 problems, which then became the Mate-Raters in the book, the data best fit an equation of the form

$$R_{\text{calc}} = at^b \quad (\text{eq. 3})$$

where t is the time required for correct solution and $\ln a$ and b represent constants whose specific values were determined for each Mate-Rater by a standard least-squares analysis of the data. The constant b was always negative in value, as demanded by an inverse relationship between time and rating.

The basic tenet of the mate-rater problems is that a more highly rated player will perceive a winning move more quickly than a lower-rated player. Both the warm-up problems and the mate-raters were actually tested on a group of players with current USCF ratings. The mate-rater problems were chosen as good tests because they were the problems that showed the highest correlation between a player's rating and his time for solving the problem — the players with the highest rating took the shortest time. For some of the relatively easy problems, which have been included among the warm-ups, the players with low ratings frequently reported shorter times than those with high ratings. Quite possibly the higher-rated players, suspecting a subtle trap, checked and rechecked their solutions, whereas the lower-rated players plunged blithely ahead, avoiding grief only because the problem was easy.

In most cases the players found the one-move problems easier than the two-move problems, and the three-move problems the most difficult (time-consuming) to solve. However, some of the later two-move problems were more difficult than many of the three-move problems. As a rule, the less experienced players found the three-move mate raters difficult to solve in 10 minutes, even though many of these same mate-raters were immediately obvious to the more highly practiced, higher-rated players.

Each mate-rater problem shows the solution plus a table that will convert the time it took to solve the problem into an approximate USCF rating, a high estimate of rating, and a low estimate of rating. The high and low values define the range in which the rating is likely to fall, since naturally the approximate rating can only be pinpointed within a certain margin of error. If a reader times himself on all fourteen of the mate-raters, the average of his fourteen approximate ranges will usually be within 100 or 200 points of his true USCF rating.

'low' are the figures from the TABLE for the amount of time taken or from the time for 600 sec. In the event the program obtained the wrong answer. These figures change because there are 14 different tests. There is, therefore, a 'rating', a 'high' and a 'low' figure given for each of the problems. These vary because the response of the computer to each problem was different. The significance of the 'average' is that if a reader timed himself on all 14 materialers the 'average' of his 14 approximate ratings will usually be within 100 or 200 points of his true USCF rating. "The 'standard deviation' is given because when the TI-58 is set to compute the mean or average all the other statistical functions may be obtained by just pressing a few extra keys. Therefore, I gave the standard deviation so readers wouldn't have to compute it themselves.

"On the notations, I don't know if Forsythe starts from the Black or White. However, I sit in White's position and record the board from the 8th rank to the first rank and go from left to right across each rank."

Misadventures of a Chess Traveler

"Several months ago, writes Dale J. Shaw, 1359 West Ave., Lancaster, CA, "I was stimulated by an ad offering Chess Challenger-7 for \$89.95. This, in itself, impressed me since I had paid slightly over \$300.00 for Chess Challenger-10 about a year ago."

"The ad implied (rather strongly) that Chess Challenger-7 was superior to any commercial chess computer. The ad reported, in tabular form, the results of a mini-processor chess computer tournament which had been won by Chess Challenger-10 and it listed *Personal Computing* as the source. The ad went on to maintain that the manufacturer, Fidelity Electronics, believed Chess Challenger-7 to be highly more proficient than Chess Challenger-10. It even stated that experimentation in the laboratory at Fidelity Electronics had demonstrated repeatedly Chess Chal-

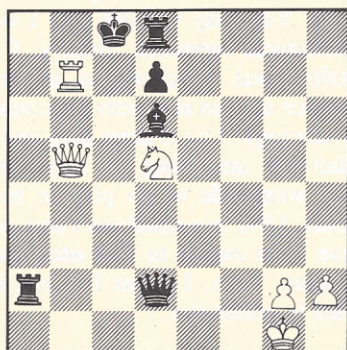
lenger-7's capability of defeating Chess Challenger-10.

"My interest is strictly that of a chess player. I am a devotee of the game, a member of the USCF, and I participate in tournaments whenever my schedule permits. Unfortunately, I don't play very well! My current rating is about 1200 but I believe that I am currently capable of playing at about 1500 and I also am convinced that that is about the top of my potential talent. So, you see, I'm simply a dedicated wood pusher.

"I got interested in chess computers when Chess Challenger-1 first entered the market several years ago. I bought it and was dreadfully disappointed. It played like an idiot, then. An intelligent idiot, of course, but an idiot nevertheless.

"A few months after my original

Continued on next page



Mate-Rater Problem 35
White to move and mate in two

Answer to Problem 35:

1. R-B7 ch B x R
2. N-K7 mate

If your solution is correct, check the following table for the approximate USCF rating at which you performed.

Table for Mate-Rater 35

time(sec)	rating	low	high	time(sec)	rating	low	high
5	2374	2174	2592	310	1424	1304	1555
10	2179	1995	2379	320	1419	1299	1549
20	2000	1831	2183	330	1413	1294	1543
30	1902	1742	2076	340	1408	1289	1537
40	1835	1681	2003	350	1403	1285	1532
50	1785	1635	1949	360	1398	1280	1526
60	1745	1598	1905	370	1393	1276	1521
70	1712	1568	1869	380	1389	1272	1516
80	1684	1543	1839	390	1384	1268	1511
90	1660	1520	1812	400	1380	1264	1507
100	1638	1500	1789	410	1376	1260	1502
110	1619	1483	1768	420	1372	1256	1497
120	1602	1467	1749	430	1368	1253	1493
130	1586	1453	1731	440	1364	1249	1489
140	1571	1439	1716	450	1360	1245	1485
150	1558	1427	1701	460	1356	1242	1481
160	1546	1416	1688	470	1353	1239	1477
170	1534	1405	1675	480	1349	1236	1473
180	1523	1395	1663	490	1346	1232	1469
190	1513	1386	1652	500	1342	1229	1465
200	1504	1377	1642	510	1339	1226	1462
210	1495	1369	1632	520	1336	1223	1458
220	1486	1361	1622	530	1333	1220	1455
230	1478	1353	1613	540	1330	1218	1452
240	1470	1346	1605	550	1327	1215	1448
250	1463	1340	1597	560	1324	1212	1445
260	1456	1333	1589	570	1321	1210	1442
270	1449	1327	1582	580	1318	1207	1439
280	1442	1321	1575	590	1315	1204	1436
290	1436	1315	1568	600	1312	1202	1433
300	1430	1310	1561				

purchase, the company offered to "upgrade" the machine if I would return it to the factory with an additional \$75.00. I did this, and while I feel that I received my money's worth, the upgraded machine (Chess Challenger-3) was still basically an idiot.

"At that time, about a year and a half ago, there were two other chess computers on the market here in Los Angeles, Boris and Compu-Chess. I was able to try both of these at a Los Angeles store which had them on display. Boris impressed me more than Compu-Chess but, frankly, I was a bit put off by some of the gingerbread built into Boris.

"A few months later, I managed to sell Chess Challenger-3 to an acquaintance and, with this as my rationalization, I bought BorisMaster. I paid, I believe, about \$300.00 for it.

"I found it to be an interesting device. I also found it to be another idiot. Of course, BorisMaster can be set to consume more than 100 hours between moves and, at that level, it might be pretty good. I don't know. I do know that I am totally unwilling to spend that much time playing a game of chess with a machine.

"At about this time, I discovered that Chess Challenger-10 does not know how to castle! I had played, perhaps, fifty games with it and had yet to see it castle. I began programming positions into it where castling was obviously the

best move. Still, it refused to castle. Finally, I set up positions where castling was the only move to avoid a rather simple checkmate. Still, it refused to castle. At that point, I called Fidelity Electronics and found that the program was flawed, not in my particular machine but in Chess Challenger-10 as a species. I was told that whenever the machine made an inexplicable move of the king rook's pawn or queen rook's pawn that it was an indication the machine would like to castle if it only knew how. They recommended that I try to override control to return the pawn to its original position and then force the device to castle. This helped a bit and it greatly improved the ability of Chess Challenger-10.

"Next, just for fun, I pitted Chess Challenger-10 against Boris. I gave Boris a ten minute interval and I set Chess Challenger-10 at a level which, according to the instruction leaflet, establishes an approximately equal "thinking" level. I selected a little-played variation of the Sicilian Dragon which, to the best of my library resources (and they're pretty good) has only been analyzed about twelve moves deep and consensus is that the position is equal. At that point, both black and white have castled. I gave Boris the white pieces and started the game from that point.

"Chess Challenger won rather easily, going up a knight on the 25th

move and, for the end of 50 moves, establishing a pronounced advantage of two pieces, two pawns and a highly superior position. At that point, I resigned Boris and decided to reset the pieces to the original position and replay the game with Chess Challenger as White. It was at that point that the victorious Chess Challenger suffered a 'heart attack.' His transformer burned out! It had literally melted! This raises an interesting point. Fidelity Electronics describes Chess Challenger as being designed to run for days, weeks or even months. That may be true but I assure you that the transformer is not up to it. (The body may be strong but the heart is weak.)

"I have now had Chess Challenger-7 for about two weeks. It does, in my opinion, play a better game than Chess Challenger-10 but I have not yet matched the two machines. At least, it knows how to castle. I have beaten it with relative ease as Black and as White at its five levels of play (two are reserved for mate-in-two problems and 24 hour postal chess).

"My current activity in chess is buying micro-processor chess computers. Specifically, I would like to find one of them capable of beating me. And, remember, I'm currently rated about 1200. You may wonder why I want a mechanical opponent. Briefly, I am a professional psychologist in private practice and am also active in consumer psychology. I have three sons and I am relatively unwilling to sacrifice my long weekends to go play in tournaments. I live in a small town and, so far, have been unable to find adequate opponents. Also, I guess I'm just interested in gimmicks."

The Russian Move

In the spring of 1980, a group of American chess players will make its second annual visit to the Soviet Union on a unique tour — THE RUSSIAN GAMBIT — arranged by Citizen Exchange Corps.

Participants will meet Russians face-to-face across chessboards in clubs, parks, factories, Friendship Houses and Pioneer Palaces in Moscow, Baku, Tbilisi and Leningrad. Simultaneous exhibitions plus discussions with noted chess personalities are planned. Visits to Soviet computer chess centers are also scheduled.

Highlights of last year's trip included a discussion meeting with former world

champion Mikhail Botvinnik, and an exhibition match with world champion Maya Chiburdanidze, plus innumerable games with Russian hosts.

Sponsors of the tour, CITIZEN EXCHANGE CORPS, is a non-profit, non-political organization which has been arranging intercultural visits to the Soviet Union since 1962. The organization's goal is to promote greater understanding between individuals and nations. For more information on the RUSSIAN GAMBIT, please contact: Malcolm Byrne, Citizen Exchange Corps, 145 Hanover St., Boston, MA 02108. Tel (617) 742-0105. (The NY office number is 212-889-7960.)

(The manufacturers of CHESSE CHALLENGER and BORIS have both told us that their upgraded models play better chess than ever before. If they are right, and if Dale's rating stays at 1200, then he's in for a rude shock when one of the machines checkmates him in less than 25 moves! That is, if you want to believe the advertising blurbs. Last month's ACM computer chess tournament should reveal advances made in microcomputer chess and should hint at what the future holds in store - ed.)

A Challenge from Cambridge

The following ad appeared in the August 22nd edition of the Wall Street Journal:

MATCH
Wits and Bits with
CCA

"The chess board is the world," Thomas Henry Huxley once said. And at **Cambridge Computer Associates, Inc.**, we believe our skills are unbeatable, both on the chess board and in the world of computing.

We're a firm of very good computer software consultants — system designers, programmers, and writers. And our technical people are the best chess players around. They're good at both algorithms and endgames. They move knights and bytes with equal flair. We believe that the mental concentration and brainpower that enable our staff to play championship chess also make them superb programmers and analysts.


To convince you, we'd like to pose a challenge — to any company or government agency in the United States...

SEND US YOUR FOUR BEST CHESS PLAYERS, AND WE'LL WIN THE MATCH!

Think of it as David and Goliath. Despite our small size, we believe that we can best General Motors, IBM, or even the United States government!

We think we can beat you, but we'd rather help you beat your competition. Good software is one important way to do that. And at **CCA**, you'll find a team of talented experts in all areas of software development. Whether you're thinking of acquiring a computer, developing an operating system, or writing application programs, we'll be happy to discuss any software plans or problems with you.

CCA is a powerful enemy on the chess board. But we can be a very good friend to you and your computer. Call or write to arrange the match or to request information on how we can help you.



cambridge computer associates, inc.
222 Alewife Brook Parkway, Cambridge, Massachusetts 02138
617-868-1111

Determined to find out how the "Davids" of CCA had fared against the "Goliaths," we contacted that organization and received the following re-

sponse from Deborah Russell, Director of Documentation Services:

"The challenge is still valid and we are still looking forward to receiving any corporate takers. So far, we have not played any matches as a consequence of the ad, although we have received quite a few inquiries. We are in the process of arranging a match with players from Digital Equipment Corporation, and will keep you informed of our progress. We did not specifically propose a wager. We are working out all arrangements on an ad hoc basis with the companies involved, and a wager might be involved in a future match.

"Our corporate interest in chess has two primary sources:

1. The fact that so many of our staff play excellent chess with ratings from 2471 to 2181. This is partly due to the effect of one player knowing and recommending another for employment) and the informal network of interest in the game that this promotes at CCA.

2. Our belief, as expressed in the ad, that the problem-solving skills that enable a person to excel at a complex game such as chess, are also very likely to be applied in excellent computer programming and system design work.

"Our aim in placing the ad was twofold:

1. To arrange chess matches and enjoy the challenge of playing and beating players from other companies — especially large companies such as IBM.
2. To acquire new business as an indirect consequence of interest in the matches — perhaps even a consulting job to design and develop a new chess-playing program or package.

"We hope that *Personal Computing* readers will respond to the challenge. And we would even be willing to hear from computer-chess programmers."

(This department wonders how many *mechanical* Goliaths will begin stirring in the underbrush now that a challenge has been flung at them.)

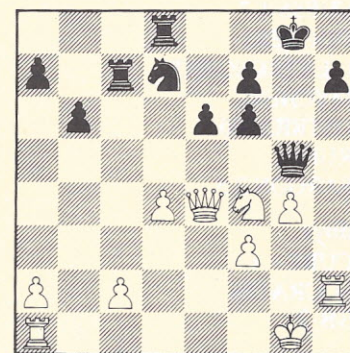
Chess Ratings from Problem Solving

"Your article in the September issue describing Donald Bloss' system for chess ratings was very interesting," writes William Cochrane of Boulder, Colorado. "And it deserves careful consideration by the chess community. In Bloss' system, he uses a set of pre-evaluated problems. The performance of humans or machines in solving these problems — based on amount of time used — then determines their chess ratings. A much more detailed analysis on the subject of chess problems and chess ratings can be found in M.R.B. Clarke's excellent 'Advances in Computer Chess I' which you have already reviewed in your magazine. Both systems, it seems to me, could be combined to establish a universally-accepted non-weighted chess rating system. Non-weighted is used in the sense that a player automatically doesn't increase his chess rating simply because

he plays a higher-rated player than himself."

Thumbing through Professor Clarke's book, one finds Prof. Berliner's chapter on the CAPS-II program.

"CAPS-II was tested on many middle-game chess tactics problems from standard textbooks on chess," reports Prof. H.J. Berliner of Carnegie-Mellon. "The program was presented with the first 200 problems from Reinfield (1958.) These problems were also presented to a Class A player. For the two performers the performance criterion was that the problem had to be solved in five minutes of (CPU) time to be counted correct. The accompanying table shows the comparative performances of the two on individual problems. The Class A player displays a far superior performance than does the program. However, the next to the last



The CAPS-II Problem
White to play and win.

Solution is shown elsewhere in chess section.

column indicates that there were quite a few instances where CAPS-II was able to solve problems that the Class A player did not solve. This serves to encourage us into believing that our basic approach has considerable potential, and will allow producing ever

better programs as more and more details of tactical perception and analysis are built in.

"The most difficult problem that CAPS-II has ever solved is shown in the position diagram labeled 'CAPS=II Problem.' This is a famous combination stretching a full five moves for each side, from the text position. (Solution to this problem is shown elsewhere in the chess section.)

Comparative Performing Table

Depth	Both right	Class A only	CAPS-II only	Both wrong
1	1	1	0	
2	6	3	0	1
3	21	9	3	0
4	20	13	4	5
5	8	12	6	2
6	6	13	5	7
7	2	8	3	2
8	1	6	0	3
9	5	2	1	2
10	0	2	1	3
11	0	2	0	8

More on Microcomputer Chess

Michael Ham, of Iowa City, IA, voices some strong ideas about microcomputer chess tournaments. "I would like to point out," writes Mike, "that many of us are limited to commercially available machines or commercial programs. For us, **commercial** programs and 'chess machines' and how they per-

form, are of paramount importance. Non-commercial or amateur programs are a good element to add to the mix, but they **must not** constitute the whole. I suggest that every tournament have two sections: commercial group and non-commercial group. A final match (perhaps six games) could take place

between the winners of the two sections." He further points out that the winner of the commercial group could not hurt the non-winners of the same group. "Runners-up in that tournament," says Michael, "would simply scurry back to their drawing boards and get ready for next year's tournament. Those that excel are immediately rewarded and we, the public, have a long-term award in the continuing strong developmental effort on the part of **all** the commercial ventures."

The suggestions made by our correspondent are, of course, excellent proposals. Larry Wagner tells us that there is a stirring, right now, among computer-chess purists, to revive the San Jose Microcomputer Chess Tournament which was so successful and which was open to both commercial and non-commercial programs. There is also a report that a well-known chess club is considering running its own official microcomputer tournament on an annual basis and open to all "players." Meanwhile, readers continue to pit commercial chess machines against cassette programs, and, happily for us all, they send us the results together with their personal comments and analysis. So, if you've "done in" one of them machines, let's hear about it. Or, if your own micro program can trounce one of them uppity commercial devices, we have the headlines waiting.

To encourage non-commercial chess-programming, we are running an elementary computer chess program (in BASIC, no less) in our December issue and are inviting readers to submit sub-routines to improve the initial program. Suitable rewards are being planned for acceptable, workable routines.

ACM Participants

The 12 primary participants scheduled to play in the ACM's 10th Computer Chess Tournament in October, were:

1. AWIT
2. BELLE
3. BLITZ 6.9
4. BS '66 '76
5. CHAOS
6. CHESS 4.7
7. DUCHESS
8. L'EXTREME
9. MYCHESS
10. OSTRICH 80
11. RUFUS
12. SARGON 2.5

Standbys:

1. CUBE 1.1
2. SOCRATES
3. BB-2

Three microcomputers are listed among the participants:

MYCHESS by David Kittinger (on a Cromemco Z-2D)

RUFUS by Charles L. Sullivan Jr. (on an Apple II)

SARGON 2.5 by Dan and Kathe Spracklen (on a special electronic chess board.)

A major highlight of the tournament will be a test of the theory: "Can man

and computer beat man alone?" Matched up for this test were David Slate (2050 rating) plus CHESS 4.7 (2050 rating); playing against David Levy (2400 rating).

Solution to CAPS-II Problem.

The program looked at many possibilities, generating a tree of 897 nodes, but delivered the correct principal variation letter perfect, as in the book. (It also correctly diagnosed all sub-variations.)

1. NxP! PxN; 2. QxKP+ K-R1; 3. Q-K7! Q-N1; 4. RxP+ QxR 5. QxR+ wins. (or 2 . . . K-B1; 3 Q-Q6+ followed by QxR; or 2 . . . K-N2; 3. Q-K7+ followed by QxR).

The complete pertinent papers on end games and problems by Editor Clarke and Prof. Berliner, plus five additional papers by other researchers, are contained in the book "Advances in Computer Chess 1", published by Edinburgh University Press, 22 George Square, Edinburgh. A recent note from Professor Clarke states, "Look out for Advances in Computer Chess 2! It will be out soon with more endgame material and more problems!"

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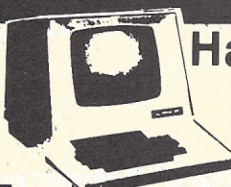
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SAVE \$69

4K - Keyboard C	\$ 595
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16K - Keyboard N	\$ 995
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32K - Keyboard B	\$1295
32K - Keyboard N	\$1295
C - calculator keyboard (only version with tape deck)	
B - Large Keyboard (graphics not on keys)	
N - large keyboard with graphics symbols	
Used 8K PET with 90-day warranty	\$650

PET ACCESSORIES

Commodore Dual Floppy Disk Drive	\$1295
Commodore Printer (tractor feed)	\$995.00
Commodore Printer (friction feed)	\$995.00
Second Cassette - from Commodore	\$95.00
Commodore PET Service Kit	\$30.00
Beeper - Tells when tape is loaded	\$24.95
Petunia - Play music from PET	\$29.95
Video Buffer - Attach another CRT	\$29.95
Combo - Petunia and Video Buffer	\$49.95
New Serial Printer Interface for PET	\$79.95
Call for Availability	
PET - Compatible Selectric in Desk	\$895.00



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Checker Challenge on the move?

Burke Grandjean, secretary of the American Checker Federation, 3475 Belmont Avenue, Baton Rouge, LA 70808, informs us that there has been a nibble on the year-old checker challenge. Chafitz Company, manufacturer of BORIS chess devices and Aristotle backgammon machines, has been making discrete inquiries about this challenge. And Burke sends along a copy of the letter he has sent to that potential respondent:

"On August 1, 1978, the American Checker Federation endorsed and financially guaranteed a \$5000 wager by Dr. Marion F. Tinsley, Tallahassee, Fla. that he could beat any program run on any computer at the game of Checkers. The match would be for 20 games, played under standard rules recognized as official by the American Checker Federation. There would be a 3-Move Restriction of 10 openings from a 142-Opening deck. Wins and draws would be counted and the first player to exceed 10 points (1 point for a won game, 0.5 point for a drawn game) would be the winner. The time rule would be either the older 5-minutes per move, or 24 moves per hour on match clocks.

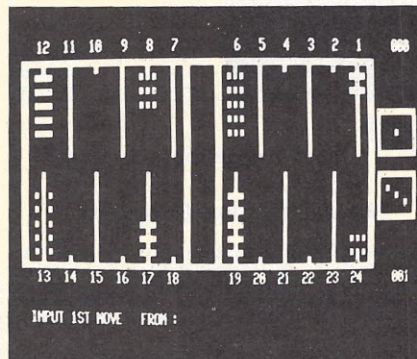
"This is a proposal for a wager — not a prize offered by the ACF. Each side would put up \$5000, winner to take all. The offer runs for 5 years, and will expire July 31, 1983.

"It may be possible to have Dr. Tinsley play against a computer through the terminal facilities of Florida A&M via telephone hookup. Four games could be played on each of 5 successive Saturdays. Or Dr. Tinsley sometimes has the Spring Quarter free — or Summer Session — and might arrange to spend a week at the location of the challenging computer.

"I would appreciate your comments on this possibility of matching a human checker player against a computer program."

A new Backgammon Program

The Software Association has a new backgammon program for the TRS-80. "BACK-40," claims Software, "is the finest opponent available for the TRS-80. Its graphic display of an official Backgammon board is unrivaled for quality, clarity, and ease of play — even the dice are generated graphically. Machine Language allows BACK-40 to respond very quickly (less than two seconds), and its strategy provides a challenge for everyone. Every feature of a regulation backgammon match is included in BACK-40, including computer or player opening depending on



BACK-40 Display on the CRT

dice roll; computer and player doubling; and scoring of all regular, gammon, and backgammon endings. Points are numbered to make move inputs simple, and all moves are checked for legality." BACK-40 is priced at \$14.95 with complete instructions and can be ordered from The Software Association, P.O. Box 58365, Dept. PC, Houston, TX 77058.

More Games For The Pet

Minnesota Micro Systems of 514 Cedar Ave, Minneapolis, MN 55454, also has marketed two new software products for PET users: Backgammon (\$19.95) and Labyrinth (\$12.95).

"Our Backgammon is an aggressive and fast program," says the company. "It fully utilizes the graphic capabili-

ties of the PET. It plays standard tournament rules, such as doubling, etc., and is a highly challenging backgammon opponent. Labyrinth is another highly challenging game, also making superb usage of the PET graphic abilities. It is an Adventure game, taking place in an old medieval castle with various floors (you decide how many), and varying levels of complexity. The object is to find the chest of gold on each floor, while fighting off and escaping from the Dragons, Goblins, Ogres, Trolls, and Giant Spiders. Daggers, Keys, Magic Rings and Cloaks will help in the quest as you make your way through the labyrinth."

Following is a copy of the instruction sheet that accompanies every backgammon cassette.

BACKGAMMON 1.0 © 1979

BACKGAMMON 1.0 is based on advanced artificial intelligence concepts and plays very well. It is assumed that the user already knows the rules for play and wagering with the betting cube.

When it is your move, hit any letter or number to "shake" dice. Play the dice in order, left to right (see below concerning reversing order) and enter only the point number you are moving from. The points are numbered 1 to 24 but these numbers are not ordinarily displayed. Hitting the # key will bring them to the screen. After you move the computer will ask "OK?". Any key except E or N will move the game along (i.e. your dice are picked up). If you use #, the numbers will stay on the screen.

Special commands are:

- X . . .Reverses the dice order.
- E . . .Wipes accidental entries.
- B . . .Bears you in off bar.
- D . . .Doubles the computer (before shake).
- A . . .Accepts computer double.
- R . . .Rejects computer double.

S...Skips a move you can not take.

◆...Claims or forfeits. Do not use this key (SHIFT Z) unless at least one piece has been borne off. The computer will award the game as though it were finished, estimating who won by how much. Thus do not, for example, hit this key before the computer has borne off one piece unless you are claiming a GAMMON.

The machine will not allow you to take illegal moves and plays standard tournament rules. We expect to continually upgrade the level of play and will provide upgrades for a nominal copying fee.

Is Go Harder than Chess?

By David J.H. Brown

Department of Computer Science

Teesside Polytechnic

Middlesbrough, Cleveland, TS1 3BA

England

(In the following article, Prof. Brown calibrates the terms "novice" and "master" as applied to both chess and GO. A novice in chess is reckoned by Prof. Brown to have a 1000 USCF rating and a master is rated at 2000. A novice in GO rates 20 kyn and a master, 1 daw.)

"Chess is the intellectual game *par excellence*. Without a chance to obscure the contest, it pits two intellects against each other in a situation so complex that neither can hope to understand it completely, but sufficiently amenable to analysis that each can hope to outthink his opponent...if one could devise a

successful chess machine, one would seem to have penetrated to the core of human intellectual endeavour." (Allen Newell, writing in 1961).

Eighteen years on, Professor Newell's comment still carries weight. Despite strenuous efforts from countless chess programmers, David Levy still managed to wipe out his automated opponent in their historic challenge match last year. But at the same time, the state of the art of computer chess has advanced to the stage where computers can now only be beaten by experts; the average club player has been left behind.

However, few would seriously contend that the techniques used by today's leading programs bear much resemblance to the human mind at work. What does this tell us about the inherent intellectual difficulty of chess? "Difficulty" is a relative term. A problem like multiplying two ten-digit numbers may be difficult for people (without pencil and paper) but easy for computers; but one like recognizing a friendly face may be easy for people but difficult for computers.

One of the things Computer Science studies is the complexity of programs. Complexity — for these purposes — is usually defined as the number of primitive operations that a program performs in the completion of its task. Certainly in an analogous way we can say that Go is more complex than chess: the number of possible games of Go is in the order of 10^{700} , as compared with a mere 10^{120} for chess. But does that mean Go is more difficult?

To answer the question whether A is

more difficult than B, we must bear two things in mind: Firstly, more difficult for whom? (e.g. people or machines?). Secondly, with respect to what standards are difficulty measures being judged?

Look at Figure 1. It shows that, with respect to human play, chess programs have been much more successful to date than Go programs. Let us assume for the moment that Go programmers are every bit as good at their jobs as chess programmers are; certainly the basic technique of minimaxing used by the current top chess program is well-known. So we could say that as far as computers are concerned, Go is more difficult than chess. This of course accepts standards that are set by people — (the grades on the vertical axis of the graph in Figure 1 are people grades.)

However, there is another point of view. Instead of mapping machine performance onto people grades, let us map people's performances onto machine grades. This gives us Figure 2. We find that Go players seem to be doing rather better than chess players. So, unless Go fundis are all cleverer than their chess counterparts, it must be concluded that people find Go easier (i.e. less difficult) than chess. Is this counter-intuitive? Most westerners I have talked to have said that they think chess is easier to play than Go. But perhaps that is because their acquaintance with chess began at an early age; Go has only caught on over here in the past decade and most of us come across it in adulthood.

I would like to venture to suggest that Go is in fact easier (for people) to play

Figure 1 Relative Performance of Chess and Go Programs

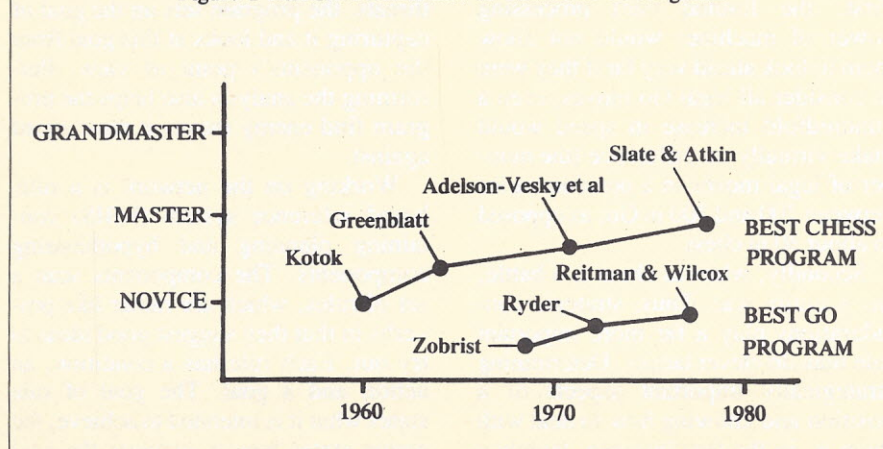
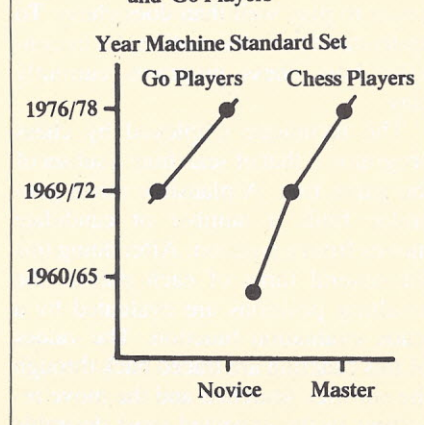


Figure 2 Relative Performance of Chess and Go Players



with respect to an absolute standard (not just that set by present-day computers). Further, I believe this to be the case because Go makes more use of our natural talents for recognizing patterns and thinking in abstract terms than does chess. We've all heard the story about the grand master who, when asked why he made a particular move, answered "because it was the only one" but could not elucidate further.

How Machines Play

One of the biggest problems facing chess programmers is how to identify the representations used by grandmasters in their play. That they use patterns to help them analyze positions is universally accepted; but after twenty years' intensive effort, the form of such patterns has thus far eluded description. Go, on the other hand, has a rich vocabulary of special terms (some examples are "light shape," "thickness," "pincer" and "probe"). Each term carries a definite concept. For the programmer, the task is one of formalizing such concepts and defining techniques for their utilization. Thus the problem of identifying an abstract representation is far more tractable for Go than it is for chess.

It may therefore come as a surprise that efforts to mechanize Go have, as yet, met with very little success. While the relative (to chess programs) weakness of Go programs is, in part attributable to the smaller amount of effort expended on their construction, there is a qualitative difference. This difference lies not between the programs, but rather within the yardstick by which such programs are measured, viz. human performance. To put it the other way round, Go requires more intelligence to play well than does chess. To understand this observation, let us consider how chess programs currently play.

The technique employed by chess programs is that of searching a subset of the game tree. A plausible move generator finds a number of candidate moves from a position. After doing this for several turns of each player, the resulting positions are evaluated by a static evaluation function. The values of this function are traced back through the sub-tree searched and the move resulting in the expected most desirable

consequences (assuming optimal play by the opponent) thereby chosen. This process is repeated each time the machine is on move, although some speculative search can be performed during the opponents' thinking time (it should however be noted that doubling search time does not produce a qualitative improvement in performance as the size of a lookahead tree grows exponentially as its depth increases).

The utility of this technique hinges on three factors:

1. The speed/capacity of the machine, which affects the size of the lookahead tree;
2. The effectiveness of the plausible move generator in rejecting pointless moves and thus eliminating them from the search; and
3. The accuracy of the static evaluation function in determining the degree of advantage of one side over the other.

Because of the lack of chess heuristics sufficiently powerful to eliminate pointless moves while not overlooking strong ones, Chess 4.7, currently the world's strongest program and defeated contender in the recent challenge match with David Levy, examines all legal moves. This gives it a certain strength in the middle game, where it will not overlook combinations of seven moves (more in the case of forcing sequences). Chess 4.7 typically examines 500,000 positions each time it makes a move, in contrast to the 50 or so examined by human players.

Such brute force techniques enable machines to play quite good chess, but they flounder hopelessly at Go. All three factors mentioned above tell us why. First, the limited (sic) processing power of machines would not allow them to look ahead very far if they were to consider all legal Go moves; even a hundredfold increase in speed would make virtually no difference (the number of legal moves in a position varies between 200 and 300 in Go, as opposed to about 30 in chess).

Secondly, whereas chess is a battle, Go is entire war. Thus, strategic considerations play a far more important role than do clever tactics. Determining strategically important aspects of a position and knowing how to deal with them is, in the first instance, largely a

matter of recognizing patterns in the shapes and positions of clusters of stones. The ability to incorporate this basic knowledge in a lookahead analysis is, in people, one of the primary differences between experts and novices. In contrast, the poor machine with no solid theoretical basis on which to make its judgements simply does not know what it should be looking for during its Sisyphean search.

Thirdly, in assessing a position, the stability of groups of stones, their influence on other groups and the size and significance of territorial frameworks as well as actual territory and prisoners all play vital roles. It is not considered viable to attempt to combine all these facets in some kind of polynomial whose value can be traced back through a look-ahead tree. Instead a method of formulating goals and finding moves to achieve them is needed.

Knowledge Engineering

I am currently wrestling with the implementation details of a program called RAG designed to play intelligent Go. RAG utilizes a network representation of the concepts exhibited by a game in progress. The nodes of the network represent primitive entities (such as stones, groups, walls and territories) at many levels of abstraction; their properties (such as strength and stability) and relationships between them (such as enclosures, linkages and support). The arcs of the network represent structural and casual relations between entities and relationships. The recognition of complex concepts such as group safety is achieved by dynamic analysis. For example, to see if one of its groups is impervious to capture threats, the program sets up the goal of capturing it and looks at this goal from the opponents' point of view. Performing the analysis also helps the program find enemy moves it must guard against.

Working on the network is a rule-based inference system (RBIS) containing planning and hypothesizing components. The components scan a set of rules, which are rather like proverbs in that they suggest good ideas to try out. Each rule has a condition, an action and a goal. The goal of rule states what it is intended to achieve, the action states how it suggests the goal

can be achieved and the condition specifies contextual constraints under which the action is expected to be effective. Conditions and actions can become goals to which other rules may apply, thus permitting chains of inferences to be constructed. RBISs are a significant development in an area of research that has come to be called "knowledge engineering" and have been successfully applied to such diverse tasks as molecular structure analysis, medical diagnosis and geological exploration.

In RAG, rules are represented as network fragments which are matched with the current position to determine foci of attention. Chains of deductions through the rules set up plans of action operating through time (by finding rules to satisfy conditions) and abstraction, space (by finding rules to carry out actions). At the lowest level of abstraction, actions are generalized move sequences to be fitted into the position being analyzed. In addition to the deductive use of rules by the planning component, they may be used inductively (by the hypothesizing component) to form speculative inferences about goals the opponent's actions might be intended to achieve. Such inferences can be used to form plans which not only achieve the program's own objectives but also refute those of its opponents.

Another ten years?

In a recent article on chess programs (New Scientist, 27 July 1978), David Levy regards the prospect of an artificial intellect with fear. Perhaps he is right, for the military significance of such research has not gone unnoticed. But at the same time, intelligent machines can add greatly to our quality of life and the investigation of artificial intelligence has much to offer our understanding of the human psyche.

The game of Go, with its inexhaustible variety, subtlety and sophistication is one of the most suitable domains for such research; the very fact that, unlike chess, it is not susceptible to the "brute force approach" distinguishes it as a unique challenge to man and machine alike. Perhaps the next ten years will see the development of a master level Go program, but I'm certainly not taking any bets!

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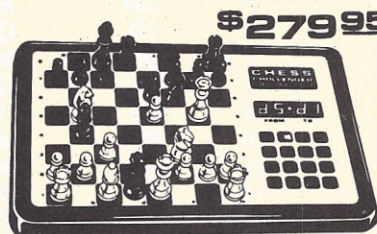
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CIRCLE 33

COMPUTER BRIDGE

BY THOMAS A. THROOP

The day before I scheduled myself to write this column I received from Fidelity Electronics one of the early models of "Bridge Challenger". This product should be available in the retail stores for your Christmas shopping.

I have already described the general characteristics of "Bridge Challenger" in my July and September columns. As pointed out in those columns, "Bridge Challenger" will bid and play, one, two, or even all four hands with human players bidding and playing the remaining hands.

Cards are dealt with a special deck (supplied with the game) marked with a bar code similar to that on grocery store items. Cards for the hands the computer is to play are passed, face down, over a scanner which identifies the cards. Each hand is then placed face down on a green felt cloth in numbered boxes corresponding to the order of scanning. The computer identifies a card it wishes to play by referencing the corresponding location on the felt cloth.

The bidding program always uses the Stayman, Blackwood, and Gerber conventions. Six additional optional conventions are available. One more of these optional conventions may be selected for each partnership the computer is to bid. These options are 5-card majors, weak 1 no-trump opening, strong artificial 2 club opening, Jacoby transfers, Baron reply to 1 no-trump opener, and a 13-15 point 2 no-trump response to an opening suit bid of one (rather than the Acol 11-12 point version).

In the limited time available to me to investigate the bidding and play of a few deals prior to preparing this column, I chose to investigate "Bridge Challenger's" bidding and play of deals played by my own bridge playing program as reported in previous columns. Two of these deals are examined in this column. Discussion of the other deals are deferred to a subsequent column.

The first deal being considered here is the one that appeared in the July column. The deal (with the N-S cards and also the E-W cards switched for

reasons I shall explain) is as follows:

COMPUTER NORTH (Dummy)

♠ J63
♥ AQ72
♦ J3
♣ AQ42

WEST
♠ 1085
♥ 104
♦ 8765
♣ KJ83

EAST
♠ 9742
♥ K65
♦ AK94
♣ 109

COMPUTER SOUTH (Declarer)

♠ AKQ
♥ J983
♦ Q102
♣ 765

In the July column the hand shown as North above was the declarer at 4 hearts and the hand shown as South was the dummy. However, when these two

particular hands were bid by "Bridge Challenger", regardless of whether or not the partnership was playing the 5-card major convention, the hand shown as South above became the declarer at 4 hearts.

To provide "Challenger" with the same playing situation, with only the hands reversed as explained above, I made the opening lead of the 8 of diamonds from West, which I won with East's king. I then led the 2 of spades from East, which "Challenger" won with South's queen. Now the situation faced by "Challenger" with South the declarer is equivalent to that faced by my program with North above as the declarer after the first two tricks. At trick 3 "Challenger" led the jack of hearts to finesse for the king. A low heart, as played by my program, would be superior to allow for a singleton or doubleton king in West's hand or four hearts to the K-10 in East's hand. In these cases "Challenger's" choice of the jack of hearts would have lost an additional heart trick.

	West (You)	North ("Challenger")	East (You)	South ("Challenger")
Trick 1	8D	JD	KD	2D
2	5S	3S	2S	QS
3	4H	2H	KH	JH?
4	8S	6S	4S	KS
5	10H	AH	5H	3H
6	5D	QH	6H	8H
7	3C	AC?	9C	5C
8	KC	QC	10C	6C
9	JC	2C	4D	7C
10	8C	4C	7S	9H
11	10S	JS	9S	AS
12	6D	3D	AD	QD
13	7D	7H	9D	10D

Tricks N-S ("Challenger"): 8				
Tricks E-W: 5				
Bidding:	South (Dealer)	West	North	East
	Pass	Pass	1C	Pass
	1H	Pass	2H	Pass
	4H	Pass	Pass	Pass

On the lead of the heart jack, I played the 4 from West, "Challenger" played North's deuce, and I won with East's king. Continuing with the same defense as in the July column, I then led the 4 of spades from East, which "Challenger" won with South's king. "Challenger" then played two rounds of trump to draw the East-West trumps.

At trick 7 "Challenger" now made an incorrect play. It cashed North's ace of clubs, rather than entering declarer's hand with the ace of spades and then led a small club toward the A-Q tenace in dummy for a finesse. This resulted in the loss of two club tricks rather than one, leading to the final result of down 2, whereas my playing program was down only 1. The complete play of the deal is shown in the accompanying tableau, which also shows one of the bidding sequences by which "Bridge Challenger" reached a 4 heart contract.

The second deal appeared in the October column. The deal is as follows:

COMPUTER

NORTH

(Dummy)

- ♠ AQ75
- ♥ A2
- ♦ AK2
- ♣ A975

WEST

- ♠ 8642
- ♥ K
- ♦ Q973
- ♣ Q1042

EAST

- ♠ J9
- ♥ 10853
- ♦ 1065
- ♣ J863

COMPUTER

SOUTH

(Declarer)

- ♠ K103
- ♥ QJ9764
- ♦ J84
- ♣ K

"Bridge Challenger's" bidding program reached the very reasonable contract of 6 hearts with the following bidding sequence:

North (Dealer)	East	South	West
1C	Pass	1H	Pass
1S	Pass	3H	Pass
4NT	Pass	5C	Pass
6H	Pass	Pass	Pass

Playing 5-card majors, "Challenger" properly opened 1 club with North's hand. As South, "Chal-

	West (You)	North ("Challenger")	East (You)	South ("Challenger")
Trick 1	2C	5C	JC	KC
2	KH	AH	3H	QH
3	3D	2H	5H	JH?
4	4C	2D	10H	9H
5	2S	7C	8H	4H
6	10C	AC	3C	3S
7	QC	9C	6C	6H
8	4S	AS	9S	10S
9	7D	AD	5D	4D
10	6S	QS?	JS	KS
11	9D	KD	6D	8D
12	8S	5S	8C	7H
13	QD	7S	10D	JD
Tricks N-S ("Challenger"): 10				
Tricks E-W: 3				

lenger" responded 1 heart. North now bid 1 spade and South properly bid 3 hearts. North, with an interest in slam, went into the Blackwood Convention by bidding 4 no-trump to ask for South's aces (in this case known to be none) and kings. South shows zero aces with his 5 club bid, but then North does not continue with Blackwood by bidding 5 no-trump to ask for kings, simply settling for 6 hearts. Throughout the bidding I passed with both the East and West cards.

As West, I opened the 2 of clubs, the same lead I made against my program in the October column. "Challenger" won with South's king. At trick 2 "Challenger" correctly finessed for the king of hearts by leading the heart queen from South. I played West's king, and "Challenger" won with dummy's ace. Next, "Challenger" properly led the deuce of hearts from dummy, I played the 5 from East, and "Challenger", as South, played the heart jack rather than finessing with the heart 9, (which would have been the proper play). The finesse of the 9 was made by my program, which would have picked up the entire heart suit without loss of a trick if the E-W hearts had been divided 3-2 with the king on-side. With the hearts divided 4-1, the finesse of the heart 9 holds the heart loss to one trick while the play of the jack loses two heart tricks.

The play continued as shown in the accompanying tableau. At trick 10 "Challenger" made a strange error, leading the spade queen rather than a low spade from dummy when South had left only the singleton king. This costs a trick, since now at trick 12 the

queen of spades is no longer available on which to discard South's losing diamond. The final result was 10 tricks won by N-S for down 2, whereas my program successfully made the small slam by losing only 1 heart and no other tricks.

I find "Bridge Challenger" to be a very entertaining product. One, two, or three players can interact with the product to bid and play while the computer bids and plays as many hands as required. A booklet describing "Challenger's" bidding system is supplied with the product and serves as an useful instructional booklet on basic principles of the European Acoll system of bidding and the most usual American style of bidding.

I received a second letter from Jim Hilger. He sent along more information on his bridge program which runs on an APPLE II. As mentioned in the August column, his program bids for North, East, and West while you bid for South. If you or North become the declarer, his playing program, which is similar to the Duisman program in that it only defends, will play the East-West cards while you play the declarer and dummy cards. I plan to report in the January or February column on the performance of his program on some of the deals we have already discussed in this column.

Remember to send your responses to the bridge survey in the October issue. This will provide information on your interests and assist in the exchange of information among those interested in computer bridge.

Zenith Computers for Small Business

Zenith Radio Corporation entered the micro/minicomputer field with its recent purchase of the Heath Company. Computers offered by the company under the name Zenith Data Systems are intended for the small business market.

The firm's microcomputer, the WH89, is contained in a compact, desk-top terminal and supplies all the power and built-in peripherals needed for most small business or professional tasks.

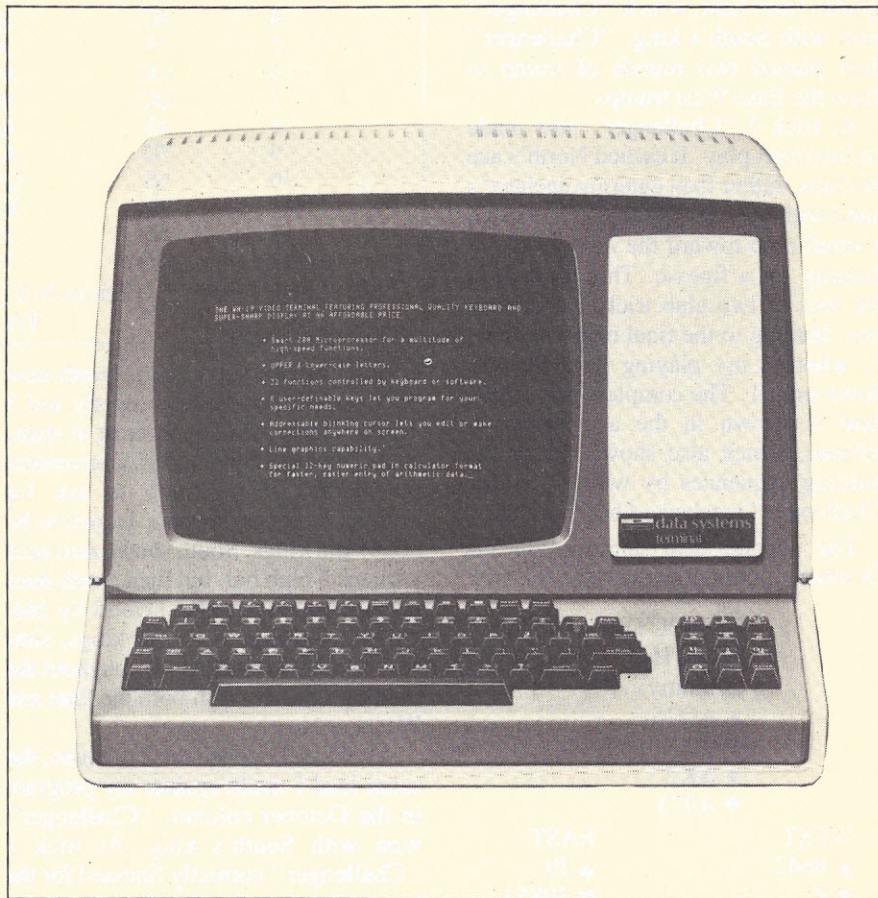
The system is designed around the Zenith Data Systems WH19 video terminal and retains the "smart" capabilities and performance of that component. It features two Z-80 microprocessors, keyboard with numeric keypad, and is supplied with 16K of random access memory, expandable to 48K. A floppy disk system, built into the terminal, offers high-speed access and mass storage capacity of 100K per disk for programs and data.

Both video terminal and microcomputer have their own Z-80 microprocessors, so the terminal never shares processor power with the computer. This dedicated Z-80 configuration results in high speed operation, easy operator control and broad system capabilities, the company said.

All terminal functions can be controlled by keyboard or software. Eight user-definable keys allow programming of special functions. Baud rates up to 9600 are keyboard selectable. Direct cursor addressing provides insertion and deletion of characters and lines anywhere on the screen, and the video terminal also features line graphics capability from keyboard or computer.

The video display format of 25 lines by 80 characters includes upper and lower case letters with descenders.

A built-in floppy disk system provides 100K bytes per 5-1/4 inch diskette. The single drive system gives high speed access to any section on the disk, and programs or data can be loaded in seconds on command. Data can be accessed and updated almost instantly.



The WH19 video terminal, designed for commercial applications, features Z-80 microprocessor control, keyboard selectable baud rates, a blinking cursor for editing at any screen location and reverse video. The self-contained WH89 computer is built around this terminal and features a disk drive to the right of the screen. In the WH89, both the microcomputer and the terminal have Z-80s so the video display never shares processor power with the computer.

A company representative said that software for the unit was capable of operating two disks and that the company was planning for an add-on disk.

The WH89 is equipped with 16K of RAM which can be expanded to 48K by plugging into sockets already provided. An accessory two-port serial I/O interface is offered for communication with printers or time-share systems via modem. All communication is EIA RS-232 standard.

The WH89 runs programs written in Microsoft BASIC and assembler languages which include practical programs for business and professional offices. Also available, as a separate package, is the Operating Systems Software designed for use with the

WH89 floppy disk system. This package includes extended Benton Harbor BASIC, an assembler, a text editor to prepare source code for BASIC and other languages, a machine language debugger and a set of disk utility programs for file manipulation.

The operating software includes Dynamic File Allocation, which assures efficient use of free space available and eliminates the need to run disk compacting utilities. A special feature permits copying and transferring between disks in the single drive system. The WH89 has a suggested list price of \$2295.

A minicomputer system, also available from Zenith Data Systems, consists of the 16-bit WH11A mainframe

and the WH27 dual-drive floppy disk system. The system is fully compatible with the DEC PDP 11/03, including optional operating systems software to run Dibol-based applications programs written for the DEC system.

The WH11A mainframe is the "heart" of the system and is supplied in a cabinet with a heavy-duty switching power supply. Seven additional plug-in slots are provided for memory and I/O cards. Operating systems software is supplied in floppy disk form and the Dibex operating system is optionally available. It enables any Dibol-based software to run on the system.

The mainframe, with hardware and systems software documentation, carries a suggested list price of \$1895. It is available separately, as are all the components of the system, or may be purchased as a package with the disk drive, operating system, and video terminal for a systems cost of \$6289.

Data storage area for the WH11A mainframe is provided by means of the WH27 Floppy Disk System which provides program and data storage sufficient for almost all general purpose application needs. Control is Z-80 microprocessor-based. The WH27 is compatible with PDP 11/03 hardware and software to allow use of the application programs written by users of DEC systems. The dual disk system, which is not currently expandable, costs \$2595.

Zenith offers Dibex for its WH11A system. Dibex is a plug-compatible operating system for all PDP/LSI 11 based computers that extends the software capabilities of conventional Dibol. Dibex is a stand-alone,

business-oriented language that can provide cost savings, design flexibility and hardware/software reliability, Zenith said.

The Dibex operating system is a series of programs which make up a time-sharing system for the small-business or commercial computer user. One or more users can perform several similar — or different — tasks through

Zenith's two systems cover a wide range of business needs.

the sharing of hardware resources. The operating system monitors the tasks, allotting each task the hardware necessary to complete its function. Multi-terminal and multi-tasking functions require hard disk mass storage.

Dibex run-time system, which includes the HT 11 operating system, lists for \$1000.

Zenith offers the HT 11 Operating System as a single-user, single task system for interactive program development and on-line applications for the WH11A. The system carries a list price of \$350. Fortran is also available at a list price of \$250.

The WH19 video terminal, engineered for commercial applications, features a keyboard, video display, Z-80 microprocessor control and keyboard-selectable baud rates. An addressable blinking cursor allows corrections or editing at any screen location, and reverse video allows emphasis of any character or character string. The video terminal is priced at \$995.

A number of accessories are available including memory boards and interfaces for insertion into mainframe or backplane slots. These are in addition to initial memory which must be added to the mainframe for basic operation. The WH11A is normally shipped with no memory and the user can specify — and order separately — the memory size most suited to his application.

Options include a 16K word dynamic random access memory expansion module with a suggested list of \$480 and a serial interface universal asynchronous transmit/receive module with selectable baud rates of 50 to 9600 for \$150.

The suggested list price of the computer system, including hardware and software, is \$6289.

A separate sales organization to support marketing of the data systems has been formed and a nationwide network of 55 parts and service facilities are already in operation to support sales.

For more information on Zenith computers products, contact Zenith Data Systems, P.O. Box 167, St. Joseph, MI 49085; (616) 982-3361.



The WH11A, (left), the heart of Zenith Data System's minicomputer, is fully compatible with the DEC PDP 11/03 series including optional operating systems software to run Dibol-based application programs written for the DEC system. Storage for the mainframe is provided by the WH27 dual Floppy Disk System (right).

WHAT'S COMING UP

SYSTEMS

Small Business Computer

Compal, Inc., has introduced its new model 8200 system designed for small business and professional office environments.

Business applications available on the system include: word processing, order entry, inventory control, accounts payable, accounts receivable, general ledger, payroll, sales



analysis, communications, professional billing, mailing, data base management and calendaring. Compal takes full responsibility for the hardware, software, training and support of the 8200 system, the company said.

System hardware includes: Z-80 microprocessor at 4 megahertz, 3 USARTs, 56K RAM memory, 24 x 80 no-glare video screen with inverse video, detached matching keyboard, dual floppy disk drives with 630K bytes of storage and typewriter-quality or high-speed printer with forms tractor.

Hardware options include: acoustic modem for communications over phone lines, sheet feeder for automatic feed of stationery and a variety of other standard peripherals.

The system sells for \$11,995 with a typewriter quality printer and \$10,995 with a high-speed matrix printer. Included in the price are: one software package, BASIC and Assembly languages, a designer desk, reference manuals, training, starter supplies and delivery. Delivery is two to three weeks. For more information contact Compal, Inc., 6300 Variel Ave., Woodland Hills, CA 91604; (213) 992-4425. *Circle No. 101*

6809 Based System on the S-100 Bus

Systems 8 and 9 from MicroDaSys bring the 6809 processor with its 16-bit instructions and internal registers, extended addressing and hardware multiplication to the S-100 bus.

The System 8 features console, keyboard, S-100 bus motherboard, 16 amp power supply, fan, 80 x 24 video/graphics card and the MD-690b 6809 based CPU board. The system includes a 2400 baud cassette interface, 10K PROM

space, 1K RAM, 20 I/O lines, RS-232 interface and interrupt driven keyboard input. The video card allows the addition of 8-color video generation as a system option.

System 9 includes those features found in the System 8 and adds a 32K static RAM card populated with 8K of RAM chips. Adding memory to the System 9 involves plugging memory chips on the 32K RAM card. Each 8K additional RAM is \$129. The System 9 is expandable to a complete disk-based system.

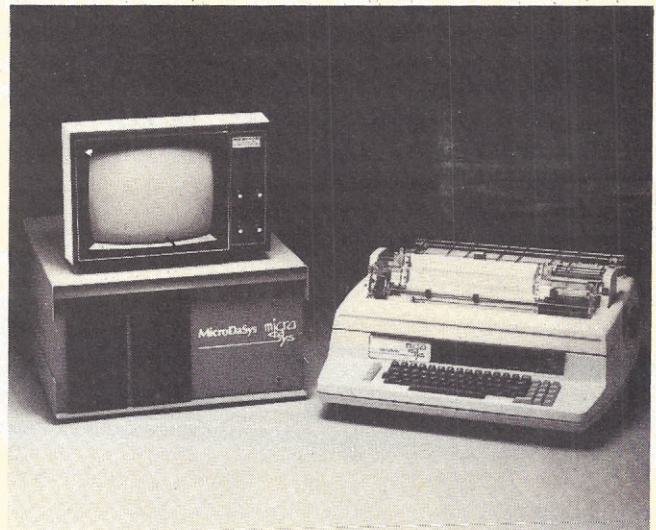
The System-8 is priced at \$648 as a kit and \$798 assembled and tested, while the System-9 is \$798 as a kit and \$998 assembled and tested. A 6809 assembler is available for \$39. The systems come with documentation. For more information contact MicroDaSys, P.O. Box 36051, Los Angeles, CA 90036; (213) 935-4555. *Circle No. 102*

Word Processor for Business

The System-Z Word Processor and Business System is the latest on line computer system from MicroDaSys. The system features the Z-80 processor, S-100 bus, CP/M disk operating system, a full-sized disk drive (standard), 32K RAM, basic printer I/O, a fully encoded ASCII keyboard, CRT video monitor and software.

The processor can type your letters and do rewrites at over 600 words per minute. You control printing parameters, and can program the system in nearly a dozen languages or use off-the-shelf programs MicroDaSys offers for the business, personal and hobbyist user.

System-Z comes with a user's guide that explains system set-up, CP/M commands, standard operation and troubleshooting aids as well as hardware specifications.



Various hardware and software options available for the system include full-color video graphics display, hard disks and additional floppy disks.

The system is available for \$2899 complete, assembled and tested. For more information contact MicroDaSys, P.O. Box 36051, Los Angeles, CA 90036; (213) 935-4555. *Circle No. 103*

PERIPHERALS

Low Cost Bidirectional Printer

Microtek, Inc., is marketing a 125-characters-per-second, 80- and 120-column bidirectional printer series which supports the full upper and lower case 96-character ASCII set in three software selectable fonts (5, 10 and 15 characters per inch) on original plus three copies. The 10 cpi font uses a 9 × 7 dot matrix.

The microprocessor-controlled printer contains a 240-character buffer, with additional data buffers to 4K optionally available in 1K increments. A self-diagnostic program is automatically run on power up. Life expectancy of the print head is 100 million characters. MTBF (mean time before failures) is 1,000,000 lines. The unit weighs 22 pounds and measures 7.3" × 17.7" × 14.8".

The pin feed paper-handling system can be adjusted to accept fan-fold forms varying from 4.5 inches to 9.5 inches wide. Forms length is software programmable in one-line increments. The vertical format unit features top-of-form control, up to 10 vertical tab settings and a skip-over-perforation capability, providing precise formatting control.



Paper can be loaded from the bottom or rear.

MT-80P Centronics-compatible parallel interface version is priced at \$750. The MT-80S serial (RS-232) version is priced at \$835. Delivery is 4-6 weeks. The MT-80G, with an IEEE-488 interface, will be available soon, the company said.

For more information contact Microtek, Inc., 7844 Convoy Court, San Diego, CA 92111 (714) 278-0633.

Circle No. 104

ATTENTION TRS-80'S

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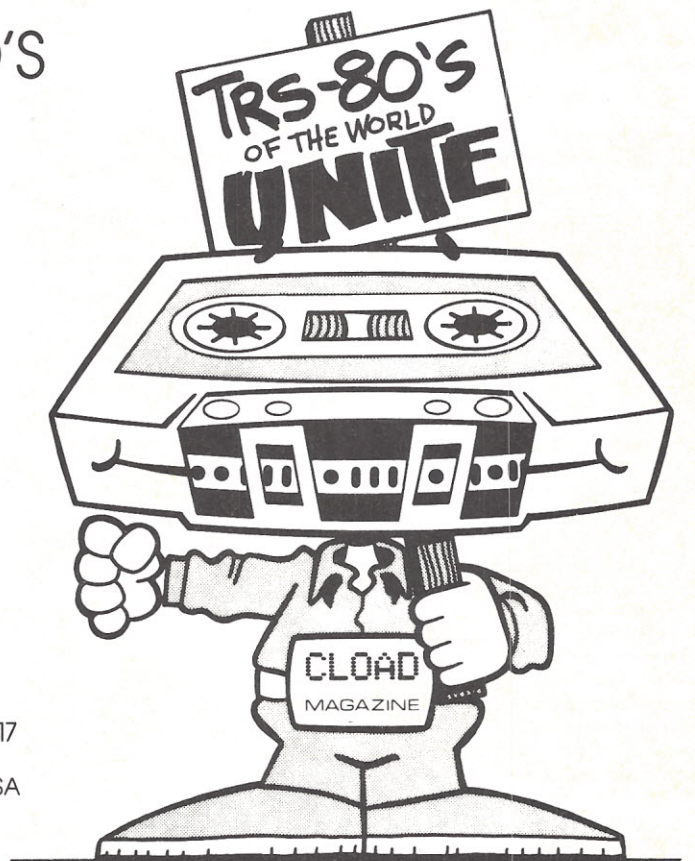
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VT100 CRT DECscope	1,895	181	99	66
VT132 CRT DECscope	2,295	220	119	80
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TI745 Portable Terminal	1,595	152	83	56
TI765 Bubble Memory Term. .	2,795	267	145	98
TI810 RO Printer	1,895	181	99	66
TI820 KSR Printer	2,195	210	114	77
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QUME Letter Quality RO.	2,795	268	145	98
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CIRCLE 47

WHAT'S COMING UP

Serial Interface for Pet

TNW Corporation offers the TNW-2000 Serial Interface, a unit that adds a bidirectional RS-232 port to the Pet and other IEEE-488 computers. Users of these computers can now interface them to standard RS-232 printers, terminals and modems, and to other computers.

Users can set the baud rate over the range of 110 to 9600 bits per second, and can switch-select the IEEE bus address, data word length/parity (8 bit words without parity or 7 bit words with even or odd parity), and operation with either 115 V or 230 V 50/60 Hz power sources (power supplies are built in). When using the interface with the Pet, you can also enable automatic conversion between the (old style) Pet and ASCII character sets for both input and output.

Other devices can be used on the IEEE bus with the TNW-2000, and it can be used with other IEEE-488 capable computers as well as the Pet. A 1-meter IEEE-488 bus cable provides a daisy chaining capability with both the Pet style edgeboard connector and the IEEE-488 Standard ribbon connector.

Priced at \$229, the interface is delivered as a fully assembled and tested unit with cabinet, IEEE bus cable, built-in female EIA (RS-232) connector and full documentation. For more information contact TNW Corporation, 3351 Hancock St., San Diego, CA 92110; (714) 225-1040. *Circle No. 123*

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CIRCLE 50

Printers, Plotters for TRS-80, Apple II and Pet

Axiom's MicroPrinters and MicroPlotters are now available with built-in interfaces for TRS-80, Apple II and Pet. The units come with cable and connector, and plug into the microcomputer with no modification to hardware or software.

Model EX-801 MicroPrinter has upper and lower case alphanumeric characters plus the graphic symbols used by the TRS-80, Apple II and Pet. The EX-820 MicroPlotter goes a step further, providing precise alignment for both horizontal and vertical dot patterns for a true hard copy of computer generated graphics.

The printer operates at up to 160 characters per second and offers the choice of three character sizes to provide 80, 40 or 20 columns.

The MicroPrinter with interface is priced at \$535 while the MicroPlotter sells for \$895. Delivery is 30 days from receipt of order. For more information contact Axiom Corporation, 5932 San Fernando Rd., Glendale, CA 91202; (213) 245-9244. *Circle No. 124*

Digitizer Recognizes Handwriting

Innovision's Digitizer tablet lets personal computer users communicate with their machines by using ordinary, hand-printed characters.

According to the company, the user first takes part in an adaptive process in which the computer is "taught" to recognize the user's style of hand-printed characters. The burden for learning is placed on the computer and not on the

WHAT'S COMING UP

user. By adapting to the user rather than requiring a pre-defined format or style, the learning process is rapid and the resulting error rate quite small. The tablet can be used to recognize the entire upper case alphabet, numerals and many punctuation marks.

Inventor Dr. David Thornburg said the tablet design not only simplifies the user interface, but also allows the learning and recognition algorithms to fit in about 2K bytes of computer memory space.

Conventional tablet designs actually monitor stylus position on the tablet surface which is desirable for many applications, such as drawing pictures. The PrestoDigitizer uses stroke direction and sequence as the parameters which are transmitted to the host processor, making the tablet suited for recognizing handwritten information.

While initially introduced as a plug-in accessory for the Pet, versions of this tablet will be available for several other popular computers in the near future, the company said.

Retail price of the unit, including software, is \$48.50. For more information contact Innovision, P.O. Box 1317, Los Altos, CA 94022. *Circle No. 125*

Acoustic Modem

A 300 baud answer/originate modem is available from Novation for less than \$200. This EIA RS-232C interface is Bell 103 compatible, has an AC wall-mount transformer and weighs 1.5 lbs. The modem is available from hobby stores and retail electronic outlets.

For more information contact Novation, Inc., 18664 Oxnard St., Tarzana, CA 91356; (213) 996-5060.

Circle No. 126

SOFTWARE

CP/M Compatible Pascal

Digital Marketing has announced CP/M compatible Pascal, known as Pascal/M.

Pascal/M allows full access to CP/M data files written in other languages (such as BASIC) and stored under CP/M. All CP/M utilities are available for managing Pascal programs and files. All I/O is fully compatible with the CP/M file structure. You can invoke Pascal programs in CP/M Submit files. Built-in procedures provide for terminal-independent cursor controls.

Standard Pascal/M is available for the 8080/85 or Z-80 CPUs. A special Z-80 version takes advantage of the Z-80's extended instruction set.

The package includes diskette with P code compiler, interpreter and runtime library; "Pascal User Manual and Report" by Jensen and Wirth; and "Pascal/M User's Reference Manual". Pascal/M is available on 5-1/4" or 8" diskettes. Cost is \$350; \$35 for manuals only. For more information contact Digital Marketing, 2670 Cherry Lane, Walnut Creek, CA 94596; (415) 938-2880. *Circle No. 127*

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CIRCLE 49



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By Michael E. Dreiger

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By Harry Hopkins

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CIRCLE 44

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CIRCLE 42

WHAT'S COMING UP

Word Processing Program

Textwriter is a text formatting program suited to the printing of personalized form letters, reports and manuals, contracts and specifications, or books and articles. It personalizes form letters by replacing name and address symbols with values read from either a separate mail list file or from the keyboard and automatically generates a table of contents and alphabetized index, thereby eliminating the task of manually changing the contents and index each time a document is changed.

The program allows the user to reference frequently used paragraphs or sections by name for automatic insertion when a document is printed. Chapters or sections can be segmented into separate files and linked together at the time they are printed, permitting editing without reading the entire document. It also accumulates and properly places footnotes at the bottom of a page when required.

Textwriter is useful for businessmen who generate personalized form letters from mailing lists; any one who writes manuals or reports requiring a table of contents and index; professionals who write contracts or specifications that share common sections; authors who write books or long articles; and hobbyists who need word processing but have a limited budget, the company said.

Textwriter is available on all commonly used floppy disk media in versions for use with CP/M and other similar systems such as IMDOS and CDOS; CP/M on TRS-80 or any other CP/M system based at 4200H; North Star DOS and Micropolis MDOS. It works with any terminal and printer; a special video output device is not needed. It can be purchased for \$125 complete or \$15 for the bound fifty-page user's manual. For more information contact Organic Software, 1492 Windsor Way, Livermore, CA 94550. *Circle No. 128*

Apple Writer Text Editor

Apple Computer, Inc., announced the Apple Writer text editor for the Apple II.

With the attachment of a dot matrix or impact printer and a television screen, the Apple II and Apple Writer become a time-saving tool for producing and revising documents.

A document needs to be typed into the computer only once; revisions or changes can be accomplished easily and quickly. Additional documents or document segments can be merged into any location within the previously typed document.

Features include ease of correction, ability to add and rearrange text, automatic search and replacement for specified words or phrases, justification of text and uppercase and lowercase type. A 48K Apple II can store at least twelve full pages of text in each on-line file.

The Apple Writer package consists of two master diskettes (a working copy and a backup copy) and an operating manual. The diskettes include an interactive tutorial which the user can call to the screen for quick learning or review.

Available from Apple dealers, Apple Writer retails for \$75. For more information contact Apple Computer, Inc., 10260 Bandley Dr., Cupertino, CA 95014. *Circle No. 129*

TRS-80 Utility Package

Packaged in a single cassette by Disco-Tech, MLUP-1 (Machine Language Utility Package No. 1) eliminates key-bounce, performs a formatted input routine, permits upward and downward scrolling, and provides insert and delete options.

MLUP-1 works equally well with TRS-80s which use TRSDOS 2.1 or 2.2, Apparat's NEWDOS or a cassette-recorder.

Targeted to programmers and relatively sophisticated microcomputer hobbyists, MLUP-1 is programmed for both TRS-80 Level II and Disc BASIC. Three versions of the package — 16K, 32K and 48K — are contained on one cassette. Hardware needed to use MLUP-1 is a TRS-80 with at least 16K of RAM.

Two features of the program are the keyboard debounce/repeat and the formatted input routine. Keyboard debounce/repeat eliminates bothersome keybounce, gives you an auto-repeat option and lets you ignore the Break key.

The formatted input routine establishes a protected input field on the video screen and lets you specify field length and location, numeric or string input mode.

The upward and downward scrolling routines enable the user to scroll any section of the video screen upward or downward by any number of lines.

The shift-and-delete and shift-and-insert routines aid manipulating text on the video screen.

MLUP-1 retails for \$25 and comes with a 76-page manual. For more information contact Disco-Tech, P.O. Box 11129, Santa Rosa, CA 95408; (707) 527-8500. *Circle No. 130*

Custom Payroll Program for TRS-80

A TRS-80 payroll program for up to 115 employees, available from the V R Data Corp., provides for Federal Withholding Tax, FICA, state, as well as local taxes; customized to your particular location. It can even deduct sick pay from FICA.

The program can also produce monthly, quarterly and year-to-date reports. It can be custom tailored for individual payroll periods: weekly, bi-weekly, semi-monthly and monthly.

Random access allows an operator to punch up any employee at any time and change any one of 44 individual fields. The system is also programmed to print checks and stubs to guarantee exacting records.

The Level II, 2 Disk, 32K payroll program costs \$99.95. For more information contact, V R Data Corp., 777 Henderson Blvd., Folcroft Industrial Park, Folcroft, PA 19032.

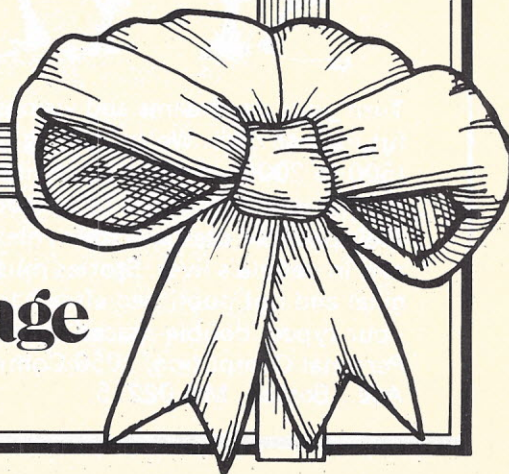
Circle No. 131

Q.

What Makes a Wonderful Holiday Gift, is 8¼ x 11¼ inches, 196 pages, & Costs Only \$7.50?

A.

See Next Page



MAKE YOUR **TRS-80** A 3-SPEED

This simple addition allows either normal operation, a 50% increase, or a 50% decrease in CPU speed. Unlike other speed mods, this one may be changed AT ANY TIME without interrupting program execution. This is critical in machine language programs where there's no software access. Shortens calculations, sorts, and CLOAD and CSAVE times. The low speed simplifies de-bugging, slows a Level II LIST, and ELIMINATES KEY-BOUNCE without software overhead. Fits inside the keyboard unit with only 4 easily accessible connections, and is easily removed if the computer ever needs service. The Mumford Micro 3-speed kit has been field proven by its many users and complete satisfaction is guaranteed. Kit includes all parts and clearly illustrated instructions for \$24.95. Fully assembled and tested, \$29.95

DUPLICATE SYSTEM TAPES WITH "CLONE"

This machine language program makes duplicate copies of ANY tape written for Level II. They may be SYSTEM tapes (continuous or not) or data lists. It is not necessary to know the file name or where it loads in memory, and there is no chance of system co-residency. The file name, entry point, and every byte (in ASCII format) are displayed on the video screen. Data may be modified before copy is produced. CLONE, \$16.95

RAM TEST FOR LEVEL II

This machine language program tests memory chips for open or shorted address or data lines as well as intermittents. It tests each BIT for validity and each BYTE in the execution of an actual instruction as in real program execution. Bad addresses are displayed along with the bad data and proper data. One complete test of 48K takes just 14 seconds. Also includes a test for errors induced by power line glitches from external equipment. RAMTEST, \$9.95

PROGRAM INDEX FOR DISK BASIC

Assemble an alphabetized index of your entire program library from disk directories. Program names and free space are read automatically (need not be typed in) and may be alphabetized by disk or program. The list may also be searched for any disk, program, or extension; disks or programs added or deleted; and the whole list or any part sent to the printer. Finally, the list itself may be stored on disk for future access and update. One drive and 32K required. INDEX, \$19.95

EDIT BASIC PROGRAMS WITH ELECTRIC PENCIL

This program allows disk users to load BASIC programs or ASCII data files into the disk version of Electric Pencil for editing. Edit line numbers, move or duplicate program segments, search for any group of characters. PENPATCH, \$9.95

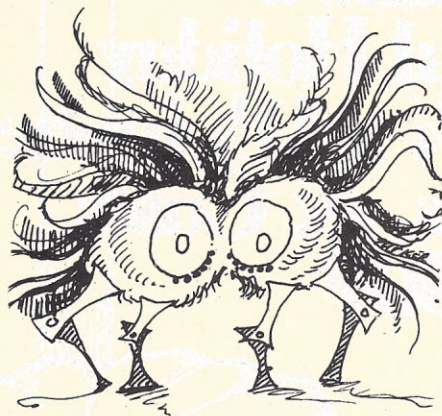
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CIRCLE 48

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WHAT'S COMING UP

Support Programs for Microsketch II

International Data Services announced Microscreen and Screen Save Utility. The programs are designed to provide support for the Microsketch II program.

Microscreen is written for 16K Level II or 32K disk TRS-80. When loaded under disk BASIC, it takes advantage of random access files for screen storage and retrieval. Screens created using Microsketch II may be further manipulated using Microscreen.

Microscreen can store up to ten screens in memory simultaneously. A single keystroke instantly loads any of these screens. Any combination of the ten screens may be loaded continuously to produce animated motion. Microsketch II may be used to draw the screens and only the parts that move need to be redrawn. After each screen is produced, it is stored on tape or disk, so that it may be loaded into Microscreen. The program can load screens from main memory at a rate of up to 16 per second or as slowly as the user desires.

A programmable command combines up to 243 single character commands including loading screens from main memory, pauses of varying length, reversing the screen, switching up to 32 characters per line and back, clearing the screen and rotating the screen up, down, left or right at varying rates. Instructions are included to delete most of the program so that a skeleton program containing only the desired screens plus the screen loading commands are retained. This may then be used to form the basis for other programs utilizing the instant screen loading capability.

The tape version of the Screen Save Utility program is written for 4K Level II or 16K disk and the disk version is written for 16K disk only. It is designed to be appended to another BASIC program and called as a subprogram to save graphic screens on tape or disk. The tape or disk may then be read by Microsketch II or Microscreen. The screen may then be modified, portions of it may be converted into graphic strings, an instant screen loading program may be generated or it may be used in demonstrations or just for fun.

Microsketch II and Microscreen use fifteen machine language subprograms. The source code for these programs including comments is available, one program per cassette, in standard Radio Shack Editor/Assembler format.

The price for each of these programs is \$3.95. For payment with order, there is no charge for shipping within the continental U.S. For more information, contact International Data Services, 340 West 55th St., New York, NY 10019; (212) 765-8610. *Circle No. 132*

TRS-80 Mailing List

Mailing List, a general purpose mailing label program for the TRS-80, lets you start and maintain a mailing list or similar data base. Operations include: add, delete, search, sorted list, modify address or remarks, and sequential print-out. You can allow up to 61 characters for either the name/title/company or remarks/code field to meet your particular needs.

You also control the exact placement of up to five labels across a page, and the placement of the Zip code on each

label. Any number of characters from the remarks/code field may be printed below the Zip code. Names can be sorted on any two fields, and you can specify a range of values to be listed according to any one field. Over 500 names can be stored using one disk drive; over 1500 with two. The program is designed to be used without prior knowledge of computers.

Written in Disk BASIC for a TRS-80 or Poly with one or two disk drives, the complete program comes on diskette and is accompanied by an instruction manual and hard copy listing for \$39.95. For more information contact Software Industries, 902 Pinecrest, Richardson, TX 75080; (214) 235-0915. *Circle No. 133*

Educational Software For TRS-80

MicroGnome's Caiware is a software system for authoring and using computer assisted instruction on the 16K TRS-80 with Level II BASIC. Caiware is an authoring system whereby the author is guided and prompted by a set of prototype questions. Caiware is intended as an aid, not as a replacement for the teacher or the textbook and the range of courseware subjects for Caiware is as broad as the interests of the instructional designers.

The first prototype question is multiple choice, with up to

eight choices. The number of attempts the student is allowed is the number of choices minus one. The second prototype provides the short answer format. The author may specify up to three correct answers, which may be spelling variations of the same answer or totally different but correct answers. The student is allowed three attempts. The author may copy elements from a preceding question by depressing a single control key. The last line of the screen is reserved for instructions to the author when in author mode.

Questions are identified by subject, lesson, topic and number, and the question number may be entered by the author or automatically generated by the program. Text may be inserted between topics and may be identified in three levels of detail. Students are automatically guided to more difficult material or presented more detailed assistance, as their performance indicates. Caiware maintains a weighted accumulative score, reflecting the student's performance by topic. Presentation of the text material in varying levels of detail is controlled by the student's performance for the topic and the author's performance criteria for each topic.

MicroGnome's Caiware program is available on cassette for \$24.95. MD residents add \$1.25 tax. Order on Master Charge, Visa, certified check or money order from Fireside Computing, Inc., 5843 Montgomery Road, Elkridge, MD 21227; (301) 796-4165. *Circle No. 134*



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CIRCLE 45

WHAT'S COMING UP

Word Processing for Apple II and Apple Plus

Charles Mann & Associates has released a new word processing program for the Apple II and Apple Plus computers. The Personal Text Processor is a fast operating package of chained BASIC programs which allow the entry, editing and printing of letters and reports.

Disk based, the program package allows for use of certain lower case hardware additions. The program prepares detailed draft and final report pages including page numbers and copy identification. Text entry generates its own line feeds or may be operated with normal carriage returns. The editing functions include line correction under cursor control, string find routines and embedded text replacement elements. Text merging including merge operation in both directions within the text body is allowed. The system automatically recognizes various forms of tabulation and paragraphing to assure correct usage even within centering or merging operations.

The user controls video output through use of the Apple Paddles to roll over text and control draft display speed. Elements for use of multiple or single disk drives and lower case display circuitry are included.

The Personal Text Processor is available from dealers for \$69.95. For dealer locations and additional information contact Charles Mann & Associates, Micro Software Division, 7594 San Remo Trail, Yucca Valley, CA 92284; (714) 365-9718. *Circle No. 135*

Software for Sorting, Billing

The Software Store, Ltd., has announced two new software packages: a general purpose disk sort/merge system and an accounts receivable and billing package.

The General Purpose Disk Sort/Merge provides a sort/merge system for sequential files. This system supports user defined file sorts and merges. Multiple operations, including user supplied programs, can be linked into a sort-stream to accomplish complex processing sequences without operator intervention.

The system is composed of two programs, Sortgen and Sort. The interactive Sortgen program is used to specify file names and define operations to be executed by Sort. All operation modules are saved as disk files and may be executed repetitively without modification. Operation modules can be revised using Sortgen. Sort allows fixed or variable length records to be sorted or merged on any number of fields located anywhere in the record. Each sort key can be specified for either ascending or descending sequence.

Billing is an integrated accounts receivable system capable of managing a large volume of accounts. The balance forward method of posting is used and supports four aging periods. A set of reports is provided which include: account master listings in any sort sequence with any account selection criteria; summary and detailed aged trial balance reports; batch transaction proof listings with checksums and totals by transaction code; customer statements with optional general and past due messages; and audit reporting for the billing and file editing programs.

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Programming students will find the program listings (mostly in popular BASIC programming language) an important aid to understanding and learning more about practical computer programming.

The Best of Personal Computing, Volume I, is available for \$7.50 plus \$1.00 postage and handling from *Personal Computing*, Box AD, 1050 Commonwealth Ave., Boston, MA 02215. Payment must accompany your order.

Expiration Date

[illegible]

ANNOUNCING TRS-80 PEOPLE'S PASCAL

"Tiny" Pascal, runs on any 16K Level II system, includes the programming structuring capabilities of full Pascal, but not data structuring. Compiled People's Pascal programs run about five-times faster than Level II Basic — graphics run eight-times faster.

People's Pascal Tape 3\$15.50
(program development system, in 7 programs, 3 in Basic. Requires T-Bug and editor/assembler)

People's Pascal Tape 6\$23.50
(easier to use — entire development system loads at once — written in machine language)

Prices to CA residents \$16.40

and \$24.88 (sales tax).

Dealer inquiries invited.

Other People's Software tapes \$8 (\$8.45 CA)

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CIRCLE 69

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WHAT'S COMING UP

The billing system includes provisions for interest charges on past due accounts and automatic fixed amount billing for specified accounts. Multiple billing cycles are supported so that the billing work load can be distributed over the month. Customer statements are written in a disk file and the statement print program provides a variety of options for selecting the statements to be printed. The system provides totals for general ledger accounting by means of user defined transaction codes.

Minimum equipment required for both products is an 8080 or Z-80 mainframe with 48K memory, floppy or hard disk, CRT and printer. CP/M with Microsoft MBASIC or Mits/Pertec Disk Extended BASIC is needed for an operating system. In addition, the billing package also requires the following application utility packages: Entry, Edit, Sort, Udeprt and Select:Ude. These utilities can be purchased separately or as a package with the billing system.

Cost for Sort and Billing is \$195 each. For more information contact Software Store, Ltd., 706 Chippewa Square, Marquette, MI 49855; (906) 228-7622. *Circle No. 136*

Software for Apple and TRS-80

Creative Discount Software released three new programs for Apple II and TRS-80 computers.

Stat Pac for the Apple II allows statistical operations and plotting in high resolution graphics. The program and its built-in data base system handle most general statistics, statistical tests, random number generation and curve fitting. The system is complete on a single diskette at \$70.

Master Text processor includes its own mailing list program and form letter element. Features include automatic line generation, insert with forward and reverse merge operations and complete upper and lower case control. The Apple II word processing system sells for \$120.

Project Manager System, designed for the cost conscious project leader preparing job estimates and control operating construction or engineering projects, is available for \$45.

For more information contact Creative Discount Software, 256 S. Robertson, Suite 2156, Beverly Hills, CA 90211; (800) 824-7888; California (800) 852-7777; Alaska or Hawaii (800) 824-7919, Operator 831. *Circle No. 137*

Information System for TRS-80

InfoBox by Micronybble Systems turns the TRS-80 into a personal or business information box. Users can store, retrieve, delete, save and read information files from cassette or disk using five simple, one-letter commands.

The basic unit of information in InfoBox is the item which can be as long as you require and does not confine the user to a pre-declared, fixed record length. There are no keys or field definitions to restrict the user. In addition to the five simple commands, InfoBox has 15 more commands which make it suitable for a wide variety of applications. InfoBox is a single, fast, compact assembly language program. It simply loads and runs. There is no initialization. Because InfoBox is an all-in-one program, it can perform all functions with no

WHAT'S COMING UP

switching back and forth among cassettes or programs.

Versions of InfoBox are available for the TRS-80 Level II and TRSDOS. Both versions use about 3K. While InfoBox does not require disk or printer, both versions have commands to print selected items on a printer. The TRSDOS version requires one disk drive.

Looking up information is simple, according to the company. The user specifies the text he wants to find. The specification can be as long as necessary. Finding the information is based on matching the user's specification. InfoBox has two matching modes. It will find items which contain the user's specification anywhere in them or which begin with the user's specification. In either mode, the user can find the first such item, the next item, or all items. InfoBox has built-in scrolling control so items do not scroll off the screen. InfoBox has other features such as tape cue, an item editor, and built-in key debounce; and InfoBox gives the user understandable, plain English prompting messages.

InfoBox is provided on cassette (TRSDOS users use the TAPEDISK utility to copy from the cassette to disk) with a 16-page user's manual with step-by-step documentation and examples.

The product is available for \$19.95 pre-paid by check, Mastercharge, or Visa. The user manual alone is \$3. Massachusetts residents must add 5% sales tax. For more information contact Micronybble Systems, 63 Dana Street, Cambridge, MA 02138. *Circle No. 138*

TRS-80 Accounts Receivable

ACCT-III from Micro Architect consists of three programs that carry out the on-line account receivable functions of a small business or a medical clinic and is specifically designed for the TRS-80 system. Accounting operations can be executed by a person who has had little accounting and computer experience. The system is not totally "invoice-oriented" so that any service business including doctors and retail stores can also use it. Even if you do not have any accounts receivable, it can be used for order entry and sales analysis, the company said.

The three programs are: initialization, account manager and report generator. Account manager lets you maintain a data base. Transaction can be paid invoice, unpaid invoice, credit, debit or payment. Sub-commands let you search, display, print, update, delete records. Order entry allows multiple items to be entered one after the other. Unit cost, quantity, sales tax rate and shipping cost will be asked for input. Total amount will be calculated by the system. Invoice can be printed if desired.

Reports consist of sales journal, receipts journal, aging analysis, end of period processing, data base lister, labels and statements. A consistency check is included to ensure data integrity. Batch report capability lets you produce three reports without operator intervention. Most reports have title, sub-title, date and automatic generated page number. The number of lines on a page can be adjusted by an on-line command. A fast Shell sort is used to sort names. Standard forms for statements can be ordered from the specified vendor.

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CIRCLE 51

WANTED:

BUSINESS PROGRAMS

Personal Computing readers want your business applications programs. Chances are, the software you've developed to solve your business problems will also help someone else faced with a similar problem.

Consider how your business benefits from your microcomputer — not only in the obvious areas of inventory, accounting and payroll, but in all departments and levels right up to the president's desk. Financial and marketing analysis, time management, planning, materials handling, product design and cost accounting are areas ripe for creative programming. Readers want help with all of these problems.

So why not share your solutions with our readers? Send us an article describing the problem you faced and how you used your microcomputer to solve it. Be sure to include a program description, program listing and sample run.

Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications, other businesses or other situations.

All submissions should be original, typed (not all CAPS), double-spaced and neat. Include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material. Also, please use a fresh ribbon on your printer for program listings and sample runs.

Feel free to call us at (617) 232-5470 if you have any questions or want to discuss specific article ideas.

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Other features include screen editing, live keyboard with blinking cursor, audit log, formatted date, formatted numeric output, hardware readiness check, I/O buffering and blocking techniques.

Two files are used: customer file and transaction file. For a dual disk system you can have 300 accounts per disk and 3000 transactions per disk. End-of-period processing allows unlimited transactions. A tag identifies all the accounts belonging to a disk. This approach allows unlimited number of accounts. Each transaction is twenty-five characters long. The account record has remark fields to allow notes for the account. Examples of uses are patient history or special attention.

ACCT-III requires a dual disk, 32K minimum DOS TRS-80 system. Single disk is allowed but will cut the data base size in half. A printer is required. Eighty columns are used for all reports, except aging analysis and statements. The programs written in BASIC are delivered on a diskette with full documentation.

The package is priced at \$69. A 24-page document is available for \$5 and will be credited towards purchase. For more information contact Micro Architect, 96 Dothan St., Arlington, MA 02174. *Circle No. 140*

CP/M Transfer System

Computer Service's Transfer allows you to connect any two CP/M compatible computers together with serial or parallel interfaces at any baud rate and transfer any type of programs or files supported under CP/M back and forth between the two machines. All that is required is that one computer use either an 8-inch soft sectors CP/M or 5-1/4-inch North Star CP/M format diskette.

Transfer is supplied with a manual showing how to set up and use the software. The only special requirements of CP/M are that you have an input routine assigned to the reader and an output routine assigned to the punch. These routines are standard on most CP/M systems, but if your system does not have the routines the manual shows what is needed.

The program is self-prompting and has a number of error messages. Transfer will also check for errors that might occur during transfer and will automatically correct those errors in most cases.

Available on CP/M 8-inch soft sector and 5-1/4-inch CP/M North Star diskettes, Transfer retails for \$49.95 and carries a money back guarantee. For more information contact Computer Services, P.O. Box 2292, Hickory, NC 28601; (704) 294-1616. *Circle No. 141*

Project Management and Time Accounting Systems

National Software Marketing Inc. has announced two new software packages for the TRS-80 using 32K and at least one floppy disk. Both systems are display oriented but readily convert to hard copy if desired, said the company.

The project management system maintains a record of projects within a project group such as a subdivision, providing data on up to 75 expense categories. Information

WHAT'S COMING UP

can be retrieved for a specific project or group showing costs to date and comparison to budget. The system is suited for construction, manufacturing or programming projects, said the company. The introductory price for this system is \$116, including shipping costs.

The time accounting system permits recording and displaying time expended in hours for a client by job category and the hours expended for each employee by client number. This system was designed to facilitate billing of clients in professional offices such as lawyers and accountants. Price is \$66.

All programs may be returned within 30 days for a refund less a \$16 service charge. The programs are shipped on diskettes in source language. For more information contact National Software Marketing, Inc., Box 6190, Hollywood FL 33021; (305) 961-4888. *Circle No. 142*

Computer Teaches Typing

PROtype computer system from American Analysis Corp. teaches typists to produce 55 words per minute in one-third the time needed for traditional instruction, said the company. In the PROtype approach, students learn to type on a computer keyboard. The computer flashes exercises on the TV screen, proofreads as the student types and immediately reports any errors. Keyboarding and practice exercises in accuracy and speed form basic parts of the program; drills in spelling are also available.

According to the company, the immediate feedback provided by the computer system shortens the learning loop between the learner's behavior and feedback from the behavior. The computer constantly paces the students and coaches them to keep reaching for their maximum potential.

In a PROtype pilot study, eighty-five percent of the students in the program learned to type 55 words per minute in one-third the time of conventional classroom instruction, said AAC.

PROtype consists of manuals for instructors and students plus computer programs adaptable to most home computers.

For more information contact American Analysis Corporation, 655 Redwood Highway, Suite 200, Mill Valley, CA 94941; (415) 383-4730. *Circle No. 143*

Graphics Software

West Coast Consultants has expanded its line of software which provides users with full graphics capabilities for Houston Instrument's Hiplot plotter. Programs are now available on tape cassettes for the TRS-80 and Apple II computers as well as the Pet.

The programs, which drive the plotter through an RS-232 interface, are written in BASIC and offer sophisticated plot control to users. Minimum memory requirement is 16K bytes.

The tapes are priced at \$50 and \$75. For more information contact West Coast Consultants, 1775 Lincoln Blvd., Tracy, CA 95376; (209) 835-1780.

Circle No. 144

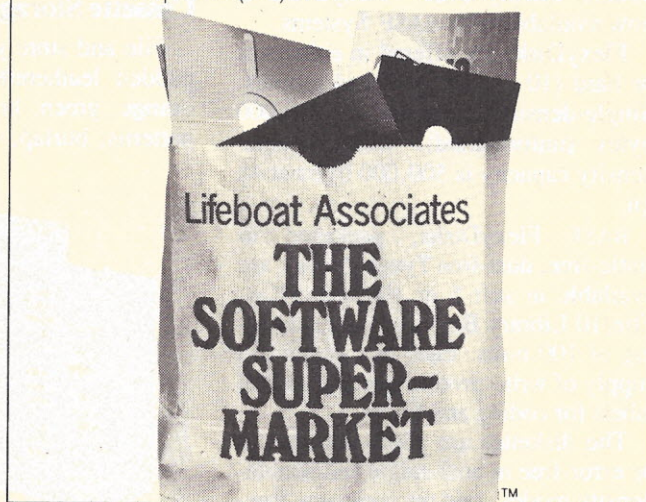
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CIRCLE 53

COMPLEMENTS

Double-Sided Flexible Disks

A line of double-sided, single and double density 5.25" FlexyDisks is now available from BASF Systems.

FlexyDisks are offered in either soft or hard (10 and 16)-sectored formats. Single-density capacity is 250,000 bytes (unformatted), while double-density capacity is 500,000 bytes at 48 tpi.

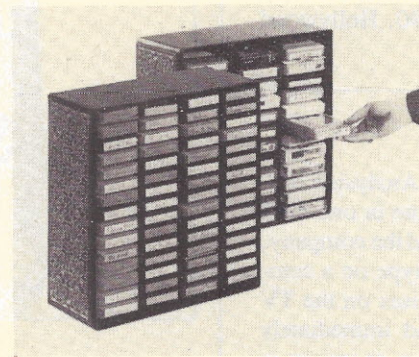
BASF FlexyDisks, packaged in static-free, dust-free Tyvec sleeves, are available in soft 5 or 10 packs, Kas-Ette/10 Library Boxes or bulk packaging of 100 units. Each box contains a supply of write-protect tabs and special labels for coding and filing.

The diskettes are 100% certified to be error-free in both single and double-density modes, said the company. Recommended list price is \$6 per diskette.

For further information contact the Computer and Business Products Department at BASF Systems, Crosby Drive, Bedford, MA 01730; (617) 271-4000. *Circle No. 145*

Cassette Storage Cases

File and store your cassette tapes in padded leatherette cases of maroon, orange, green, brown or black reptile patterns; burlap, denim or woodgrain



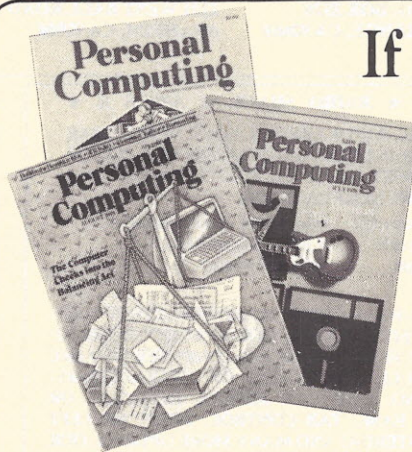
textures; or gold tooling (illustrated) on black, brown or green kidskin.

Jesse Jones Box Corporation offers these cases with molded plastic storage slots, tilted to prevent tapes from falling out. A supply of pressure-sensitive labels is included with each case.

All storage cases are approximately 14" high. Prices are: 60 cassette capacity — \$16.95; 30 cassette — \$11.95. Specify type of case, capacity and color. Add \$1.50 per case for shipping. Bank Americard/Visa, Master Charge or American Express are accepted. Free catalog is available on request. For more information contact Jesse Jones Industries, P.O. Box 5120 Dept. C, Philadelphia, PA 19141; (215) 425-6600. *Circle No. 146*

External Calculator Keypad for TRS-80

VR Data's TRS-80 keypad offers several operations — a double-width zero



If you're missing any of these you have gaps in your data bank.

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How to write for Personal Computing

You've written the programs we want to publish. You — the *Personal Computing* readers — are using your computers in businesses, homes, offices and schools. Other readers, just as software-hungry as you, are eager to try out your programs, your applications and your techniques. So why not share what you've done by submitting an article to *PC*?

It's easier than you might think. Remember: we're more interested in practical programs and useful applications than in fancy prose. And our editorial staff stands ready to help with any problems you encounter in writing your article; just give us a call at (617) 232-5470.

Here are some handy guidelines to help you get started.

First, decide what kind of article you want to write. Do you have a *business program* that will help an executive, salesman, doctor, lawyer or shopkeeper function more efficiently? Think about how businesses can benefit from microcomputers — not only in the obvious areas of inventory, accounting and payroll, but in all departments and levels right up to the president's desk. Financial and marketing analysis, time management, planning, material handling, product design and cost accounting are areas ripe for creative programming.

How do you use your computer for *home and personal applications* in your living room, kitchen, study or den? Again, think beyond the obvious areas of checkbook balancing and budgeting (though these areas are far from exhausted) to other applications. Hobbies, home management, household inventory, gardening and landscaping, personal income and expense analysis, personal mailing lists and word processing are just a few ideas to spark your imagination.

What *education programs* have you written for children, adults, professionals, businessmen and teachers? Computers can not only teach children basic subjects such as spelling, math, geography, economics, civics, grammar, literature and science, but can help adults review or sharpen skills in these areas as well. How else can computers function in or out of the classroom to aid learning? To help teachers and administrators?

Are you proficient in some programming technique or special computer area you could explain in

a *tutorial article*? How do you save time, money, computer memory or frustration when programming or using your computer? Others can benefit from the same techniques you use.

Computer games, history, humor and fiction are other areas rich in article and story ideas.

Your second step is to write the text of the article. Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications, other businesses or other situations.

Third, prepare your supporting documentation. Include at least a program listing and one or two sample runs, and add program notes to explain any special commands used or other special features of your program. Use charts, diagrams, figures and photos if they help explain your program and its use.

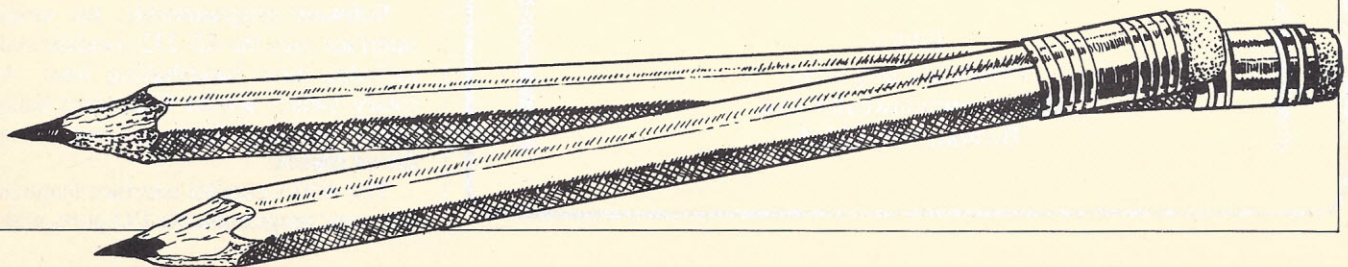
Finally, mail your manuscript. Address it to Editor, *Personal Computing Magazine*, 1050 Commonwealth Ave., Boston, MA 02215.

A few suggestions: All submissions should be original, typed (*not* all CAPS), double-spaced and neat. Please include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material.

Since we photograph program listings and sample runs exactly as you send them to us for publication in the magazine, please be sure you use a fresh ribbon for computer printouts. If you don't have a printer, you can type your listings single spaced; but again, be sure you use a new ribbon. (If your program relies heavily on graphics, you can photograph sample runs from your CRT. But take care to avoid distortion due to the curve of the screen.)

Feel free to call us if you have any questions or want to discuss specific ideas. We can give you feedback and suggest appropriate slants and approaches.

We're always looking for fresh, original ideas. While these guidelines will help you in preparing material for *Personal Computing*, don't assume we don't want your idea just because it's not mentioned here. Let us and our readers know what *you're* doing with your computer.



key, numerals 1 to 9, plus, minus, and enter — in calculator format.

The external keypad is available with connector for \$64.95. For more information contact VR Data, 777 Henderson Blvd., Folcroft Industrial Park, Folcroft, PA 19032. *Circle No. 147*

P.C. BOARDS

High Resolution Pet Graphics

A high resolution graphic display board that upgrades the capability of

the Pet has been introduced by Micro Technology Unlimited.

K-1008A-P Visible Memory permits high resolution graphics, such as math plots, 3-D line drawings in perspective and arbitrary character sets. During image update there is no snow or visible interference, the company said. When not used for graphics, the board serves as an 8K byte expansion memory. K-1008-3C graphic software is also offered.

The graphic board puts up a high resolution matrix of 64,000 dots (320 wide × 200 high), and allows control of the on/off state of each dot individually and independently. The board interfaces to the Pet with the K-1007A-1 bus adaptor with easily detached ribbon cable interconnects. Without bus adaptor, the K-1008A-P can be used with AIM-65, Kim-1 and SYM-1 computers. The K-1005A-P expansion card file is optional.

Visible Memory is priced at \$243, the K-1007A-1 bus adaptor at \$99, the K-1005A-P card file at \$80, and the K-1008-3C software at \$20.

For more information contact Micro Technology Unlimited, 841 Galaxy Way, P.O. Box 4596, Manchester, NH 03108; (603) 627-1464.

Circle No. 148

Share Your Home Programs

How do you use your computer at home? Family finances? Budgets? Meal planning? Entertainment? Teaching the kids? Word processing? Home security? Investment planning? Helping with your *other* hobby?

Our readers are as software-hungry as you. So why not share the home applications programs you've developed? Send us an article describing your application and the program you wrote to implement it. Be sure to include a program listing and sample run.

Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications or other situations.

All submissions should be original, typed (not all CAPS), double-spaced and neat. Include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material. Also, please use a fresh ribbon on your printer for program listings and sample runs.

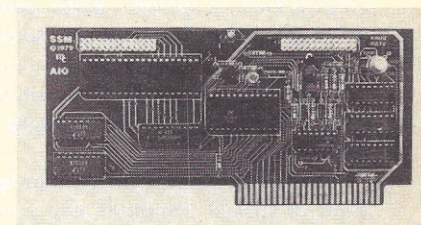
Feel free to call us at (617) 232-5470 if you have any questions or want to discuss specific article ideas.

Mail your manuscript to

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Personal Computing
1050 Commonwealth Ave.
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Apple Serial and Parallel Interface

SSM's A10 Serial and Parallel Apple Interface allows interfacing an Apple II with peripherals such as printers, plotters, terminals, modems and other computers.



Software programmable, the serial interface uses the RS-232 standard and includes three handshaking lines. A rotary switch selects 9 standard baud rates. On-board firmware provides a driver routine.

The A10's parallel interface features software programmable I/O ports with

enough lines to handle two printers simultaneously with handshaking control. The manual includes a software listing for controlling parallel printers and a parallel driver routine is available in firmware as an option.

The A10 comes with serial interface firmware, two cable assemblies and a comprehensive users manual with application notes. It is available assembled and tested (\$175) or in kit form (\$135). For further information contact SSM, 2116 Walsh Ave., Santa Clara, CA 95050. *Circle No. 149*

High-Resolution Graphics Interface

Cromemco's Super Dazzler Interface (SDI), a high-resolution graphics interface designed for use in Cromemco computer systems, displays color or black-and-white images with up to 756 by 484 point resolution. SDI circuitry is contained on two cards.

SDI uses direct memory access to display the contents of a display memory. Each pixel of the display may be mapped from one nybble or from one bit of the display memory. Bit-mapped or nybble-mapped mode is software selectable. In fact, one part of the picture may be displayed in one mode and another part in the other mode, said Cromemco. Also, 12K or 48K of memory may be used for the display memory, leading to four basic modes of operation.

In color operation, up to 4096 colors can be selected. In nybble-mapped mode any 16 of the 4096 colors may be displayed in a single picture. In bit-mapped mode any two of these colors may be displayed in a single picture. For black-and-white nybble-mapped mode there can be 16 shades of grey.

A new two-port memory card has been developed for the SDI. Picture information is accessed by the SDI through a connector on the top of these cards. Just three 16K two-port memories hold a full 48K picture.

SDI is available for \$595. The 16K two-port memory card (Model 16KTP) costs \$795. For additional information contact Cromemco, Inc., 280 Bernardo Avenue, Mountain View, CA 94043; (415) 964-7400. *Circle No. 151*

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Don Inman and Kurt Inman

This is the only book to describe in detail the machine language monitor operations of the popular Radio Shack TRS-80 computer. Each command is explained and discussed in detail and examples are given to show how the commands may be used. Each step of every sample program is accompanied by a sketch of the corresponding video display for complete "no question about it" understanding operations. The examples constitute practical applications which make this book not only instructional, but useful as well.

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To order, or for more information write: dilithium Press, Box 92, Forest Grove, Oregon 97116. Add 50¢ postage and handling for each book you order.

*TRS-80 is a registered trademark of the Tandy Co.

CIRCLE 35

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CIRCLE 39

"Lending Libraries" for Tapes and Disks

BY WILLIAM R. PARKS

Since starting this column I have gotten some interesting letters and comments from readers. I welcome such feedback. I received the following letter recently from Gordon Gibson of California. Because of the interesting points made by the author, and the implications for the future of personal computing, I feel obliged to share the important ideas.

"I'm writing in response to your article in the August 1979 issue. I'd like to add another idea for promoting the home computer. People generally go to the city library to do research and pick up books, tapes, records and, in case of the San Jose City Library, 35mm films. Therefore, wouldn't it be great if libraries acquired software programs to be checked out like books!!!!!! I've contacted some of the staff at our own library and asked if they might be carrying programs for home computers. They told me that they didn't have any programs at this time, but by next year they would, indeed, have them. If you are interested in more information in this exciting, new area you can talk to Robert Luchessi, media manager at the San Jose Library.

"I might also add that I received a brochure in the mail from the Milliken Publishers. They have programs for popular home computers which can be used in school for drilling purposes. These programs also contain a manager program so that a teacher can track the progress of her students. If you're interested in getting a copy of this brochure, request 'Computers in Education'. Address of the company is Milliken Publishing Company, 1100 Research Blvd., St. Louis, MO 63132."

I agree with Mr. Gibson. It certainly would be great if libraries started carrying software, programs, games, etc., on tapes and disks to be checked out like books, films, and records. Nearly

every community in the United States has one or more libraries — i.e., public free libraries, public school libraries, or a nearby college library.

Why not make a copy of this article and take it to your local library and ask the librarian to consider what Gordon Gibson has mentioned in his letter?

Magnetic media will have their own sections in public libraries of the future.

Planning for the future is a task that should begin today! Shouldn't all librarians plan for the coming development of home computing? We can now check out records from most libraries — in the coming years we should be able to do the same for computer programs on tapes or disks!

It's exciting to imagine that at some future time most libraries will be carrying software. They may even have a room full of different microcomputers, just as they now have multimedia rooms. Such a development would indeed be exciting for several reasons: 1) Hardware manufacturers would benefit from increased sales to thousands of libraries. 2) Software publishing companies would realize a great new potential market which doesn't even exist today! 3) People who can't afford home computers or software programs would have free access to the best of both

categories. The general public would benefit. Kids would probably be inclined to spend more hours at local libraries than they do now. 4) Interest from large blocks of concerned citizens would force legislators to beef-up library budgets to accommodate the new technology. In this type of situation businessmen could really exert some pressures.

Those are just a few of the possible developments as libraries start purchasing software on tapes and disks for general circulation.

The argument that circulating software will inhibit the industry is not valid. Knowledgeable leaders in the book publishing industry know that libraries do, in fact, promote book reading as well as book sales. If the local library fosters book reading, then it promotes the sale of books among a large reading public. Similarly, a library stocking software will foster interest among users to purchase their own latest versions of programs from software houses. So the software house will benefit when its material is freely circulated. See you at the library — I'm going to take a copy of this article to the library staff for consideration in their future plans!



William R. Parks is Assistant Professor of Mathematics and Computer Science at State University of New York, Fredonia, New York 14063.

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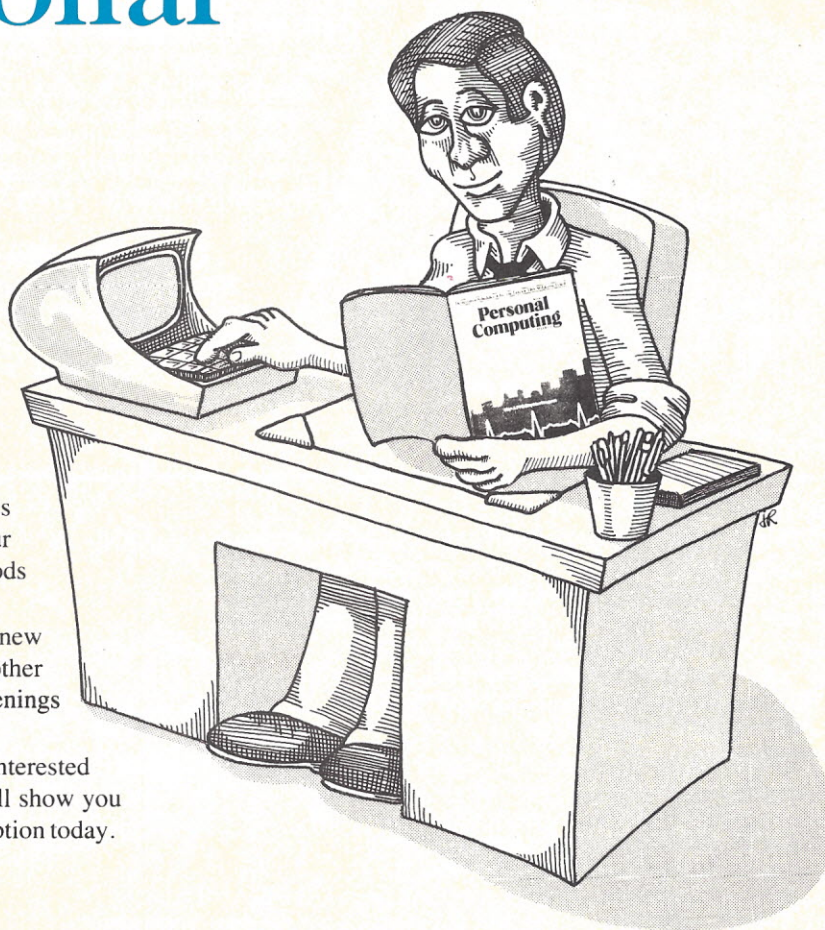
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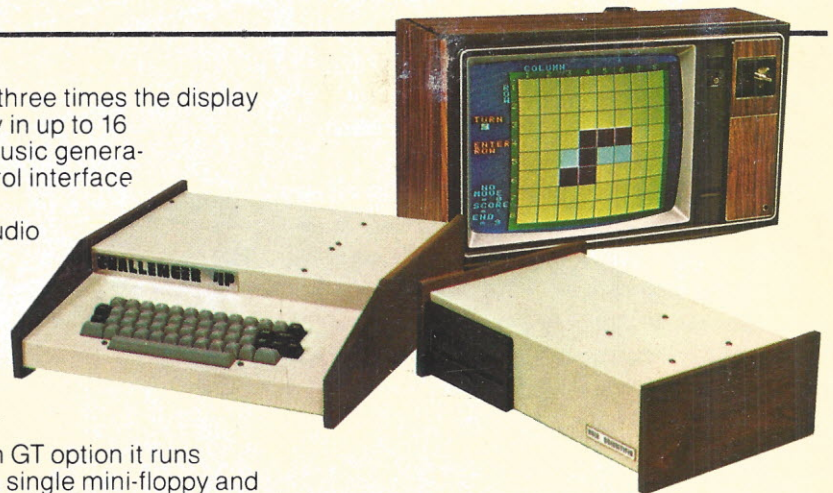
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